2017

Neuroscience Changes More Than You Think

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NEUROSCIENCE CHANGES MORE THAN YOU CAN THINK

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Abstract

In this Essay, we consider the contribution of a startling new book, Law & Neuroscience (L&N), by Owen Jones, Jeffrey Schall, and Francis Shen. It is a law school course book (a genre not often the focus of a scholarly review essay) that supports fundamental inquiry into the relationship between emerging neuroscientific insights and doctrinal conceptions in the law. We believe that the book shifts the paradigm and so may profoundly affect the course of normative evaluation of law. In this Essay, we trace and evaluate the "argument" of the book and suggest ways in which its contribution to the normative analysis of law may impact students and legal scholars for years to come. We believe that L&N is that rare work that will, quite literally, change the way people think.

The book's power rests, securely, on two premises: (1) legal doctrine derives mainly from our folk psychological intuitions (based on our inferences about others' beliefs, desires, and intentions) concerning human agency and, in particular, our capacities for practical reason; and (2) progress in the sciences of the mind, including neuroscience, casts grave doubts on folk intuitions at the core of our understanding of human agency. It is folk psychology that gives way to an understanding informed by neuroscience, compelling revision of our notions of responsibility embodied in contracts, torts, and criminal law.

Part I describes the dynamic balance and pedagogical power that the format of L&N achieves. That dynamic and power is illustrated in the contrast between the neurological reductionism endorsed by Francis Crick and skepticism expressed by Stephen Morse concerning the relevance of neuroscience to legal doctrine. On Crick's view, if our folk psychological intuitions come into conflict with known neurological facts, it is folk intuitions that must go. On Morse's view, by contrast, there are, either in principle or merely in fact, no discoveries in neuroscience that threaten our folk view of

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†† Rita Anne Rollins Professor of Law, The College of William & Mary School of Law. We are indebted to four of Professor Alces's students at the College of William & Mary School of Law, Tyler F. Chriscoe, J.D., 2016, Eric M. Loose, J.D., 2016, W. Matt Morgan, J.D., 2015, and Tyler J. Rosa, J.D., 2016 for their outstanding research assistance on this project.

ourselves. In their judicious selection of theoretical perspectives and case studies, the editors of L&N sustain the Crick-Morse dichotomy across a wide range of substantive legal issues.

We complete our analysis in Part II by taking a stand of our own—we show the very real challenges to law presented by the Crick-Morse dichotomy. With Crick and others, we argue that the former authority of our folk intuitions must be ceded to conflicting findings in science. In defense, we show that recent discoveries from cognitive neuroscience integrate with discoveries in affective neuroscience, and, from those premises, we defend two claims: (1) many human actions—those we intuitively judge to be evaluable in moral and legal terms—are, as a matter of fact, causally influenced by affective processes about which we cannot reason, precisely because those processes do not rise to conscious awareness; and (2) some information about our affective processes can rise to conscious awareness, but, even when that occurs, the actual causes of our actions are liable to misinterpretation. We conclude that, if either (1) or (2) is correct, assumptions at the core of our folk view of human agency cannot be sustained. The shift in paradigm is profound indeed.

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I. INTRODUCTION

"Folk psychology"[1] is the basis of legal doctrine, and probably deontological normative theory, too. Much of law and deontological moral theory understand human agency in terms of beliefs, desires, and intentions held by human actors, the subjects and objects of legal doctrine.[2] But what if

1. "A term for people intuitively understanding and talking about human psychology. Humans have an immediate understanding of themselves and other people." René Rosfort, *Folk Psychology*, *in* ENCYCLOPEDIA OF SCIENCES AND RELIGIONS (Anne L.C. Runehov et al. eds., 2013); *see also* Ian Ravenscroft, *Folk Psychology as a Theory*, STAN. ENCYCLOPEDIA PHIL. (Aug. 16, 2016), https://plato.stanford.edu/entries/folkpsych-theory/ (providing an overview of folk psychology).

2. This is not to say, of course, that significant portions of the law do not reflect consequentialist

folk psychology (not a pejorative term) is wrong, or just incomplete? Newtonian physics, by way of useful analogy, can get you through the day, unless your day involves space travel or nuclear energy. If you do want to travel in space or cause a nuclear reaction, you need relativity.[3] Maybe there is something more you would need to understand human agency if and when folk psychology is insufficiently acute, where the broad strokes of belief, desire, and intent fail. Neuroscience may provide that something more, and cognitive psychology,[4] certainly an aspect of neuroscience, may be to folk psychology what Einstein's relativity is to Newtonian physics. Law based on folk psychology and its often-implicit deontology[5] might be based on incomplete conceptions of human agency. That would be significant, and problematic for legal doctrine and normative theories of law based on such incomplete conceptions.

Were there means to reconceive, to conceptualize more accurately, the nature of human agency—what, in fact, it means to be human—then those means would shift the paradigm,[6] profoundly. We believe that law and legal philosophy are at something of a precipice (more profound than a mere crossroads), and that the challenge neuroscientific insights present to law may well lead to changes in our understanding of morality as morality is reflected in legal doctrine. The best evidence of that paradigm shift is found in a course book, not a monograph or treatise. Professors Owen Jones, Jeffrey Schall, and Francis Shen have assembled teaching materials that change the way we think of the relationship between law and legal actors.[7] They do not offer answers to the crucial fundamental questions; they do much more: they formulate the crucial questions in terms that resonate with the normative foundations of law; they pose questions the law cannot (yet) answer, but surely must. Before their important contribution to legal pedagogy, the questions were not asked and so the consequences of their answers were latent.

In this Essay, written by a law professor and a philosophy professor, we describe and appraise Law & Neuroscience (L&N).[8] While we discuss the scope of the book and its strengths as well as occasional weaknesses, our focus is on its significance as well as the significance of the fact that the paradigm

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intuitions. Walter Sinnott-Armstrong, *Consequentialism*, STAN. ENCYCLOPEDIA PHIL. (Oct. 22, 2015), https://plato.stanford.edu/entries/consequentialism/.

3. Markus Pössel, *From $E=mc^2$ to the Atomic Bomb*, EINSTEIN ONLINE (2010), http://www.einstein-online.info/spotlights/atombombe.

4. Cognitive psychology is the study of the brain and "higher mental processes such as attention, language use, memory, perception, problem solving, and thinking." Richard J. Gerrig & Philip G. Zimbardo, *Glossary of Psychological Terms*, AM. PSYCHOL. ASS'N, http://www.apa.org/research/action/glossary.aspx (last visited Feb. 18, 2017).

5. Deontological ethics or deontology is the normative ethical position that judges the morality of an action based on the action's adherence to a rule or rules. Rosalind Hursthouse & Glen Pettigrove, *Virtue Ethics*, STAN. ENCYCLOPEDIA PHIL. (Dec. 8, 2016), https://plato.stanford.edu/entries/ethics-virtue/.

6. Thomas Kuhn explains the nature of "paradigm shifts" in the scientific world, where new discoveries both change the mode of thinking of those engaged in science as well as leave unanswered questions for future scientists to study. *See* THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS 10 (3d ed. 1996).

7. OWEN D. JONES, JEFFREY D. SCHALL & FRANCIS X. SHEN, LAW AND NEUROSCIENCE (2014) [hereinafter L&N].

8. *Id.*

shift effected by this book will be accomplished, largely, in the classroom. It is in the classroom where (candor compels us to acknowledge) most legal scholars and philosophers will have more impact than they will through any number of articles or books they write for colleagues in their fields. Our conclusion: Jones, Schall, and Shen will make law students and their professors uncomfortable. Perfect.

In the parts of the Essay that follow, we consider the effectiveness of the book in a separate law school course on Law & Neuroscience[9] and in the Philosophy curriculum.[10] We take account of the ways in which the book challenges the conceptual/empirical distinction (too often misunderstood)[11]: are the limitations of the science a function of *current* (and remediable) empirical shortcomings of the science or are those limitations a function of the science's failure to capture something about human agency that the science just could not capture? We also touch, briefly, on what the book may reveal about the impact of neuroscience on the so-called "naturalistic fallacy," the way "ought" may or may not be a reflection of the "is."[12] And, finally, we explore the significance of neuroscience for conceptions of responsibility, in terms that resonate with the normative calculus in the tort, contract, and criminal law doctrine.

II. THE BOOK'S CONTRIBUTION TO THE STUDY OF LAW

The law must make moral sense, and that is a simple matter of efficacy wholly irrespective of whether legal doctrine vindicates something like natural law (even assuming there is such a thing). One could understand law as the social form of a normative elaboration: social interaction (the reason for and context of law) is built on emotional reaction, heuristics that guide interpersonal behavior.[13] Visceral emotional reactions to inappropriate violence, for example, are reified as moral imperatives ("thou shalt not kill") and ultimately codified in legal doctrine, which is able to distinguish murder from other forms of homicide in order to vindicate normative conclusions that promote the corporate welfare.[14] That is a stark diagram of the dynamic, but it distills the calculus into its essential constituents.[15] That schematic also

9. Professor Alces has taught the Law & Neuroscience course as a law school course, once with a preliminary draft of L&N and more recently with the first edition of L&N.

10. Professor Davies specializes in the philosophy of biology and psychology. For the past several years he has been teaching and publishing on the implications of the sciences of the mind for theories of responsibility. L&N is likely to serve as a valuable resource in his advanced seminars.

11. Though we are not yet willing to allow that there is a worthwhile distinction between the conceptual and the empirical. *See generally* PAUL S. DAVIES, SUBJECTS OF THE WORLD: DARWIN'S RHETORIC AND THE STUDY OF AGENCY IN NATURE (2009).

12. L&N, *supra* note 7.

13. For more on the notion that social interactions and law are based on heuristics and basic emotions, see Jonathan Haidt, *The Emotional Dog and Its Rational Tail: A Social Intuitionist Approach to Moral Judgment*, 108 PSYCHOL. REV. 814, 830 (2001) and JONATHAN HAIDT, THE RIGHTEOUS MIND: WHY GOOD PEOPLE ARE DIVIDED BY POLITICS AND RELIGION (2013).

14. SARAH BROMBERG, THE EVOLUTION OF ETHICS: AN INTRODUCTION TO CYBERNETIC ETHICS (2d ed. 1999).

15. *See* PETER A. ALCES, A THEORY OF CONTRACT LAW: EMPIRICAL INSIGHTS AND MORAL PSYCHOLOGY 276 (2011) ("In order to reach a conclusion about the normative proclivities of legal doctrine, it

emphasizes the mechanics of the calculus. There is not (or at least there need not be) anything "real" in some divine or existential sense about the genesis of human morality: it describes the rules, the expectations that accommodate coexistence and thriving in a cooperative context. We are social, and the continuum from emotional reaction to moral conclusion to legal doctrine is the "is" that determines our sense of "ought." For present purposes, though, it is sufficient to recognize that evolutionary basis of law and morality, the morality that matters to, that determines, law.

Emotional reactions, the precursors of morality, are the product of predisposition, if not strictly "hard wired."[16] While there is some room for cultural differentiation, for the most part, to be human is to admire what humans admire (e.g., maternal love and devotion) and to abhor what humans find loathsome (e.g., sexual abuse of children). It is not difficult to see, drawing on those parenthetical examples, the very direct connection between individual and group thriving, on the one hand, and our "natural" emotional reactions, on the other. This is essentially similar to the basis of sexual attraction: the same characteristics that make someone attractive to another are the characteristics that generally confirm genetic fitness.[17] But poems are not written about genetic fitness, as such.

Once we understand the constituents of emotional reaction, we can appreciate that morality may be empirical, that it may reduce to certain fundamental properties. And we are, concomitantly, nothing more than the sum of such fundamental properties, which, in turn, are nothing more (and nothing less) than electrical, chemical, and structural incidents of our brains. There is, at the end of the day, nothing about us that cannot be captured in such empirical terms; there is no whole that is greater than the sum of its parts, no matter how pleasant or reassuring it might be to imagine otherwise. But once we understand human agency—and so human emotion, morality, and law—in those empirical terms, what have we said about the law and about philosophy that would make sense of responsibility within such a conception of human agency? Jones, Schall, and Shen help us approach that question.

A. Reconceptualizing Legal Doctrine

Neuroscience, at least the impact of neuroscience on conceptions of human agency that matter to law, is something of a recent revelation: surely we have known for thousands of years that we have brains, and that it is our brains that define who we are as individuals and as a species. But it is only within the last fifteen years or so that we have come to consider the impact that

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is worthwhile (perhaps indispensable) to begin with a better understanding of moral reasoning . . . . Legal doctrine is, after all, a way for humans to order normative relations. The only source for such legal morality would be the human normative sense, and there is no obvious argument in favor of basing legal morality on anything other than human morality, which is a product of our moral psychology.").

16. *Id.* at 278, 288.

17. *See* Steven W. Gangestad, *Sexual Selection and Physical Attractiveness*, 4 HUMAN NATURE 205, 206–08 (1993) (suggesting that physical attractiveness and sexual selection are linked due to "good genes" and one's "investment potential" in a mate).

neuroscientific insights might have on legal doctrine.[18] And it was, not entirely coincidentally, about fifteen years ago that functional magnetic resonance imaging (fMRI) of the brain became more generally available[19] on a scale that accommodates the type of neuroscientific research that can reveal the mind at work in ways that matter to the tort, contract, and criminal law (as well as all of the other areas of law that are elaborations of the fundamental premises formulated in those three primary doctrinal areas).

It is one thing to incorporate a "reasonable person" standard into the tort law; it is wholly another to understand the neural constituents of that standard in terms that may be revealed in fMRI images, images that depict the perceptual and cognitive incidents of the decisions that lead to the behavior that we might decide is negligent. The same is certainly true of the consent criterion in contract law: once we appreciate what it means, at the neural level, to conclude that there is the type of consent that will support the imposition of contract liability—and can quite literally *see* the formation of consent[20] (as well as the impact of deception)—we recognize that the concept is a normative conclusion rather than a simple empirical observation. In essence, we enforce what some normative conception determines we should enforce, and cast that conclusion in terms of "consent." So deconstructed, the reality of consent, as anything more than a normative conclusion designed to serve a normative purpose, seems elusive.

Now, insofar as neuroscience investigates human agency at the *neuronal* level, and endeavors to find the reasons for behavior in the operation and cooperation of neural systems, its application to the inquiries particularly pertinent to the criminal law would seem most obvious. It is already well accepted that mental deficiency may mitigate, or obviate entirely, criminal liability for some anti-social acts. The insanity defense[21] is commonplace in

18. There is a history of neuroscience being used as evidence in the courtroom. The defense for John Hinckley, the man who attempted to assassinate President Ronald Reagan, introduced a CAT scan in an attempt to show his shrunken brain tissue, which can be an indicator of schizophrenia. Stuart Taylor, Jr., *CAT Scans Said to Show Shrunken Hinckley Brain*, N.Y. TIMES (June 2, 1982), http://www.nytimes.com/1982/06/02/us/cat-scans-said-to-show-shrunken-hinckley-brain.html; *see also* United States v. Hinckley, 672 F.2d 115 (D.C. Cir. 1982). In *People v. Weinstein*, a PET scan was admitted to show that the defendant, charged with murder, had a cyst in his arachnoid membrane. 591 N.Y.S.2d 715, 716–17 (Sup. Ct. 1992). The defense offered that as an explanation for Weinstein's violence. *Id.* Recent developments such as fMRI have opened more doors for neuroscientific evidence because the scans measure changes and patterns in brain activity. *See, e.g.*, Emily R. Murphy, *No Lie MRI Being Offered as Evidence in Court*, STAN. L. SCH.: L. & BIOSCIS. BLOG (Mar. 14, 2009), http://blogs.law.stanford.edu/lawandbiosciences/2009/03/14/no-lie-mri-being-offered-as-evidence-in-court/ (reporting on child protection hearing in California where defense is planning on introducing fMRI test findings as evidence of parent telling truth, arguing that "the fMRI-based lie detection (or 'truth verification') technology is accurate and generally accepted within the relevant scientific community . . . .").

19. *See* Hannah Devlin et al., *Introduction to FMRI*, NUFFIELD DEP'T CLINICAL NEUROSCIS., https://www.ndcn.ox.ac.uk/divisions/fmrib/what-is-fmri/introduction-to-fmri (last visited Feb. 18, 2017) (explaining the history of fMRI and its growing use in the early 1990s).

20. *See, e.g.*, *id.* (explaining activation maps in fMRIs); Nat'l Inst. Biomedical Imaging & Bioengineering, *Imaging Technique Can See You Think*, SCIENCEDAILY (Nov. 30, 2016), https://www.sciencedaily.com/releases/2016/11/161130144008.htm (describing new fast fMRI technique that can be used to "see" human thought).

21. The M'Naghten Rule, applied to determine if a defendant should be found not guilty by reason of insanity, asks first whether the defendant knew what he was doing, and then whether the defendant knew what

popular depictions of the criminal law, and the U.S. Supreme Court has taken into account neuroscientific insights in reaching important conclusions about the culpability and punishment of adolescents and others whose intellectual capacity is distinguishable from that attributed to "normal, healthy adults."[22] The imposition of criminal liability requires the coincidence of *mens rea* and *actus reus*. Mental defect or deficiency may undermine the conclusion that a defendant had the state of mind, the *mens rea*, necessary to impose criminal liability.[23]

There are at least three aspects of state of mind (neural state) that may be pertinent to the mental calculus determinative in the criminal law: (1) ability to (a) distinguish right from wrong[24] and (b) control one's actions;[25] (2) ability to appreciate the connection between the act committed and the punishment thereof;[26] and (3) psychopathy, the neural state evidenced by the inability to empathize, to feel the pain and fear of others (including one's victims).[27]

Neuroscience can discover patterns of brain activity and structure that are consistent with aberrational behavior.[28] In fact, that can be done at an impressive level of acuity; in theory, that may be done at the level of a single neuron.[29] When and whether the available imaging techniques will achieve the

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he was doing was wrong. M'Naghten's Case (1843) 8 Eng. Rep. 718, 722 (HL). In contrast, the Model Penal Code section concerning insanity provides: "[A] defendant is not responsible for criminal conduct where (s)he, as a result of mental disease or defect, did not possess 'substantial capacity either to appreciate the criminality of his conduct or to conform his conduct to the requirements of the law.'" MODEL PENAL CODE § 4.03 (AM. LAW INST. 1962).

22. Roper v. Simmons, 543 U.S. 551, 617–18 (2004) (Scalia, J., dissenting) (stating that if adolescents are mature enough to decide whether to have an abortion, then they are likely mature enough to be tried for the death penalty); *see also* Graham v. Florida, 560 U.S. 48, 74–75 (2010) (holding that juveniles cannot be sentenced to life without parole for non-homicide crimes).

23. *See, e.g.*, Ford v. Wainwright, 477 U.S. 399 (1986) (holding that Eighth Amendment prohibits State from imposing death penalty on those who are insane).

24. *See, e.g.*, Delling v. Idaho, 133 S. Ct. 504, 504 (2012) (Breyer, J., dissenting) ("The law has long recognized that criminal punishment is not appropriate for those who, by reason of insanity, cannot tell right from wrong.").

25. *See, e.g.*, *Roper*, 543 U.S. at 598 (identifying "lack of control" as one reason "juveniles [may] be forgiven for failing to escape negative influences in their whole environment").

26. *See, e.g.*, Panetti v. Quarterman, 551 U.S. 930, 934–35 (2007) ("Gross delusions stemming from a severe mental disorder may put an awareness of a link between a crime and its punishment in a context so far removed from reality that the punishment can serve no proper purpose.").

27. It is estimated that 10%–15% of criminal offenders are psychopaths, compared to only 1% of the general population. *See* Robert Hare, *Focus on Psychopathy*, FBI L. ENFORCEMENT BULL. (July 2012), http://leb.fbi.gov/2012/july/focus-on-psychopathy; *see also* Paul Babiak et al., *Psychopathy: An Important Forensic Concept for the 21st Century*, FBI L. ENFORCEMENT BULL. (July 2012), http://leb.fbi.gov/2012/july/psychopathy-an-important-forensic-concept-for-the-21st-century (noting that more men are psychopaths than women). Psychopaths are characterized by both interpersonal traits, such as manipulativeness, lack of empathy, and failure to accept responsibility or feel guilt; and affective traits, such as a lack of behavior control, proneness to boredom, and shallow emotional affect. Kent A. Kiehl, *A Cognitive Neuroscience Perspective on Psychopathy: Evidence for Paralimbic System Dysfunction*, 142 PSYCHIATRY RES. 107, 128 (2006).

28. *See* Kate Kelland, *Study Finds Psychopaths Have Distinct Brain Structure*, REUTERS (May 7, 2012, 4:35 PM), http://www.reuters.com/article/2012/05/07/us-brains-psychopaths-idUSBRE8460ZQ20120507 (detailing study that compared brain scans of criminals and found "the strongest evidence yet that psychopaths have structural abnormalities in their brains").

29. One such study observed the stimulation of single neurons in a live monkey as it performed goal-oriented hand movements. Giuseppe Di Pellegrino et al., *Understanding Motor Events: A Neurophysiological Study*, 91 EXPERIMENTAL BRAIN RES. 176 (1992); *see also* THOMAS Z. RAMSØY, INTRODUCTION TO

level of acuity that will identify a particular behavioral anomaly with a particular chemical, electrical, or structural state is a subject of both conjecture and opinion.[30] If it is just a matter of time and research before that would be realized, then the limitations of the current science are empirical, and advances in measuring techniques and devices may overcome empirical limitations. But if there will still be a gap, some *cause* that will certainly evade measurement no matter how sensitive our measurement techniques and devices, then the insurmountable limitation would be "conceptual" rather than empirical: there would be a gap there for which the science could not account, and there will, in turn, be a limit to the impact neuroscience can have on law, or any theory of human agency, for that matter.[31]

And if there is a causal factor for which neuroscience cannot account, then there will be a dualism that materialism cannot deny. Now, that dualism need not be the substance dualism of Descartes,[32] but it would be a dualism that would insulate fundamental conceptions of human agency—and in turn, responsibility—from the empirical analysis and perspective of neuroscience.[33] To date, the critiques of neuroscience, as it would be applied to law, have posited such a dualism, even while denying doing so. Critics of the neuroscientific perspective draw distinctions between the brain and the "human being,"[34] or the brain and "the person,"[35] or, perhaps most typically, between the brain and the mind.[36] But, for materialists, for those most favorably impressed by the neuroscientific perspective, there is no difference between the brain and the human being (or the person), and mind is just a manifestation of brain as fist is a manifestation of hand.[37]

So, how to address that fundamental disagreement in terms pertinent to law?

NEUROMARKETING AND CONSUMER NEUROSCIENCE 66–67 (2014) ("[T]here are single cells within your own head that respond ONLY to one particular item[.] About a decade ago, researchers at CalTech recorded the activity of single neurons . . . while epilepsy surgery patients watched images of people, objects and places. Here, they found one cell that responded only to Jennifer Aniston! Another cell only responded to images of the Sydney Opera House, and yet another cell responded only to images of actress Hale [*sic*] Berry." (citation omitted)).

30. *See generally* MICHAEL S. PARDO & DENNIS PATTERSON, MINDS, BRAINS, AND LAW: THE CONCEPTUAL FOUNDATIONS OF LAW AND NEUROSCIENCE 22 (2013) (detailing neuroscience imaging).

31. *See id.* (positing distinction between "conceptual" and "empirical"). *But see* DAVIES, *supra* note 11 (casting doubt on efficacy of such distinction).

32. Substance dualism is the notion that there are "two kinds of substance: matter, of which the essential property is that it is spatially extended; and mind, of which the essential property is that it thinks." Howard Robinson, *Dualism*, STAN. ENCYCLOPEDIA PHIL. (Feb. 29, 2016), http://plato.stanford.edu/entries/dualism/.

33. *Id.*

34. M.R. BENNETT & P.M.S. HACKER, PHILOSOPHICAL FOUNDATIONS OF NEUROSCIENCE 3 (2003) ("[Neuroscience's] discoveries in no way affect the conceptual truth that these powers and their exercise in perception, thought and feeling are *attributes of human beings*, not of their parts—in particular, *not of their brains*.").

35. PARDO & PATTERSON, *supra* note 30, at 22 ("[P]ersons are not their brains . . . .").

36. *Id.*

37. Robinson, *supra* note 32.

B. Presenting the Tension

Law & Neuroscience begins with that fundamental quandary by juxtaposing two brief quotes, one from Francis Crick, winner of the Nobel Prize in Medicine or Physiology,[38] and one from Stephen Morse, Professor of Law and of Medicine at the University of Pennsylvania.[39] First Crick:

> "You," your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. Who you are is nothing but a pack of neurons . . . . [A]lthough we appear to have free will, in fact, our choices have already been predetermined for us and we cannot change that.[40]

Crick's "astonishing hypothesis" *is* the materialistic, neuroscientific conclusion: human agents are the sum of mechanical processes that are perhaps more complex than any other machine so far developed (or of which we are aware) but *essentially* no different from other systems. Professor Robert Sapolsky has likened the human agent to a car[41]: just as you would not "punish" your car when it does not start one cold morning by "sentencing" it to the garage until it "learns its lesson," it would be inefficacious to rely on insubstantial and dualistic conceptions of human agency—perhaps informed by folk psychological focus on beliefs, desires, and intent—to punish rather than to discover the *physical* source of the problem, and all problems of human behavior have a physical (neuronal) source that could only respond to a physical (ultimately neuronal) solution.[42]

Juxtaposed with that perspective is the caution of Professor Stephen Morse, perhaps the highest-profile critic of the neuroscientific materialistic perspective:

> Neuroscience has the potential to make internal contributions to legal doctrine and practice if the relation is properly understood. For now, however, such contributions are modest at best and

38. The prize was awarded to Francis Crick jointly with Maurice Wilkins and James Watson "for their discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material." *The Nobel Prize in Physiology or Medicine 1962*, NOBELPRIZE.ORG, http://www.nobelprize.org/nobel_prizes/medicine/laureates/1962/ (last visited Feb. 18, 2017).

39. L&N, *supra* note 7, at 3.

40. FRANCIS CRICK, THE ASTONISHING HYPOTHESIS: THE SCIENTIFIC SEARCH FOR THE SOUL 3 (1994).

41. L&N, *supra* note 7, at 18.

42. *See* Robert M. Sapolsky, *The Frontal Cortex and the Criminal Justice System*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y B: BIOLOGICAL SCI. 1787, 1794 (2004) ("Whereas it is true that, at a logical extreme, a neurobiological framework may indeed eliminate blame, it does not eliminate the need for forceful intervention in the face of violence or antisocial behaviour. To understand is not to forgive or to do nothing; whereas you do not ponder whether to forgive a car that, because of problems with its brakes, has injured someone, you nevertheless protect society from it."); Jeffrey Rosen, *The Brain on the Stand*, N.Y. TIMES MAG. (Mar. 11, 2007), http://www.nytimes.com/2007/03/11/magazine/11Neurolaw.t.html (quoting Robert Sapolsky: "You can have a horrendously damaged brain where someone knows the difference between right and wrong but nonetheless can't control their behavior . . . . At that point, you're dealing with a broken machine, and concepts like punishment and evil and sin become utterly irrelevant. Does that mean the person should be dumped back on the street? Absolutely not. You have a car with the brakes not working, and it shouldn't be allowed to be near anyone it can hurt.").

> neuroscience poses no genuine, radical challenges to concepts of personhood, responsibility, and competence.[43]

That assessment of the neuroscientific "state of the art," as it were, is somewhat obscure: is Professor Morse saying that the science *should* not inform legal conclusions or that the science, in its current state, *cannot*, at least effectively, inform legal conclusions? As a matter of fact, it would be inaccurate to conclude that neuroscientific insights cannot impact the law: there are already several examples of courts using neuroscience to determine, at least in part, the results of important issues pertinent to the tort,[44] contract,[45] and criminal law.[46] Now, it may be that courts, and the attorneys who frame the issues for them, have been precipitous in their consideration of neuroscientific evidence. And, indeed, there is some dubious science that even the most enthusiastic supporter of the neuroscientific perspective would not endorse.[47] But those who practice, particularly those who litigate today and for the foreseeable future, ignore the potential incorporation of neuroscientific insights into legal argument at their peril.

If, however, Professor Morse is suggesting a more broad conclusion, something more akin to the dualistic assertion that there is a crucial *something* pertinent to normative (including legal) analyses that the materialism of neuroscience simply cannot comprehend (this construction of his position seems more in line with his assertions elsewhere),[48] then he is not just observing that the folk psychological perspective animates the law but that the folk perspective *must* be the animating principle that makes sense of legal doctrine.[49] And it is not much of a leap, if a move at all, from the conclusion

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43. Stephen J. Morse, *Lost in Translation?: An Essay on Law and Neuroscience*, *in* 13 LAW & NEUROSCI.: CURRENT LEGAL ISSUES 2010, at 529, 562 (Michael Freeman ed., 2011).

44. L&N illuminates areas where neuroscience has informed tort law's distinction of "mental" and "bodily" injury. *See* L&N, *supra* note 7, at 354–61.

45. L&N highlights the use of neuroimaging to discern whether an individual had capacity to contract. *See id.* at 10–12 (reproducing the case of Van Middlesworth v. Century Bank & Trust Co., No. 215512, 2000 WL 33421451 (Mich. Ct. App. May 5, 2000)).

46. L&N treats at some length the Supreme Court's use of neuroscience to evaluate the criminal law's treatment of juveniles. *See* L&N, *supra* note 7, at 72–100 (discussing *Roper v. Simmons* and *Graham v. Florida*); *id.* at 569–78 (discussing *Miller v. Alabama*); *see also* Roper v. Simmons, 543 U.S. 551, 569 (2005) ("[A]s the scientific and sociological studies respondent and his *amici* cite tend to confirm, '[a] lack of maturity and an underdeveloped sense of responsibility are found in youth more often than in adults and are more understandable among the young. These qualities often result in impetuous and ill-considered actions and decisions.'" (quoting Johnson v. Texas, 509 U.S. 350, 367 (1993)); Graham v. Florida, 560 U.S. 48, 68 (2010) ("[D]evelopments in psychology and brain science continue to show fundamental differences between juvenile and adult minds."); Miller v. Alabama, 132 S. Ct. 2455, 2464 n.5 (2012) ("The evidence presented to us in these cases indicates that the science and social science supporting *Roper*'s and *Graham*'s conclusions have become even stronger.").

47. Francis X. Shen & Owen D. Jones, *Brain Scans as Evidence: Truths, Proofs, Lies, and Lessons*, 62 MERCER L. REV. 861, 883 (2011) (discussing Cephos Corporation's brain-based lie detection technology: "As *United States v. Semrau* illustrates in the brain-based lie detection context, attempts to use brain scans in legal contexts will often precede the full appropriateness of doing so.").

48. As Professor Morse has stated, "Brains don't kill people. People kill people." Stuart Fox, *Laws Might Change as the Science of Violence Is Explained*, LIVE SCI. (June 07, 2010, 4:44 AM), http://www.livescience.com/6535-laws-change-science-violence-explained.html.

49. Stephen J. Morse, *Determinism and the Death of Folk Psychology: Two Challenges to Responsibility from Neuroscience*, 9 MINN. J.L. SCI. & TECH. 1, 2–4 (2008). Professor Morse writes:

> Roughly speaking, the law implicitly adopts the folk-psychological model of the person, which

that folk psychology is the foundation of legal doctrine to the conclusion that deontological principles are, at least quite often, the foundation of legal doctrine. That is, folk psychology, as a normative theory of law, depends on the same principles as does deontological philosophy. So if folk psychology fails to accurately capture the nature of human agency, so does deontology, and the two together would fail as accurate, as complete and sufficiently acute, conceptions of the relationship between human agents and legal doctrine.

The Crick-Morse dichotomy, then, is crucial. It presents the fundamental tension that matters throughout the neuroscience-law dialectic. Presentation of that persistent dialectic must be consistently considerate of what is at stake: the normative foundation of law and human agency. Demonstrating the dynamic in an accessible and compelling way would seem daunting. There is only so much that can be done with the teaching materials normally incorporated in law school course books. But here is where L&N shifts the paradigm: the book presents the dynamic by maintaining the tension through the balanced organization and presentation of accessible materials that are unsettling, and unsettling in a pedagogically compelling way. You may not finish the book with great confidence in either Crick's enthusiasm (or resignation?) or Morse's skepticism, but professors and students who work through the book will never think about the law, or human agency (for that matter), the same way again. The book does what great teaching does: it changes the student, profoundly. That sweeping conclusion requires elaboration.

C. Through a Glass, Darkly

Maintaining focus on that fundamental normative tension in the course of a survey of the areas of the law that might be affected by its resolution is difficult and challenging for both professor and student. Organization can do a great deal to juxtapose the (at least ostensibly) conflicting perspectives, and the organization of L&N is strong. The first portion of the book, in particular, presents the big normative question(s) and invites critical analysis of the important distinctions and discontinuities.

> explains behavior in terms of desires, beliefs and intentions. If practical reason plays no role in explaining our behavior, as some neuroscientists and others claim, current responsibility doctrines and practices would have to be radically altered or jettisoned altogether. I suggest, however, that the conceptual and scientific support for this argument is thin at present and that there is good ground to believe that our conception of persons as agents is unlikely to disappear. Consequently, legal and moral doctrines that depend on agentic personhood are secure—at least for now.
>
> . . . .
>
> Consciousness and action are central to the law's view of the person. The capacity for intentional activity or stillness—the capacity for agency—is a central aspect of personhood and is integral to what it means to be a responsible person. We act because we intend. Responsibility judgments depend on the mental states that produce and accompany bodily movement and stillness. This is how we think about ourselves, and this is the concept of the person that morality and law both reflect.
>
> The law's view of the person is thus the so-called "folk-psychological" model: a view of the person as a conscious (and potentially self-conscious) creature capable of practical reason, an agent who forms and acts on intentions that are the product of the person's desires and beliefs. We are the sort of creatures that can act for and respond to reasons. The law properly treats persons generally as intentional creatures and not as mechanical forces of nature.

Id. at 2–4.

1. Neuroscience and the Individual

The editors use a compelling context—the murder of a spouse—to depict the promise and limitations of neuroscience as it relates to individual brain anomalies.[50] That is, how should the law respond when an injury or disease of the brain is apparently or actually the cause of an individual's aberrational behavior? Brain conditions that affect a particular individual rather than all similarly situated members of a class (usually determined by reference to age or gender, or some combination of the two) raise different issues (or similar issues differently) from brain conditions that cut across all members of some demographic group.

The challenge here in both settings is doctrinal as well as evidentiary. Doctrinally, it is important to appreciate how the extant law can accommodate analysis that takes normative account of behavior caused by a brain condition's impact on a particular individual's behavior. The evidentiary question is different: given the doctrine, how do advances in neuroscience confirm a normatively (even morally) significant connection between a brain state or condition and behavior (or state of mind) that the law regulates? Would neuroscientific insights compel a change in doctrine or just an adjustment of relevance and probity in the court's evidentiary determinations? It is one thing to admit an fMRI scan to establish that the defendant was capable or incapable of a particular brain state; it is wholly another to conclude that such a brain state is normatively significant, that it should or should not be determinative of culpability or liability.

Chapter 2 of L&N describes the pertinence of neuroscientific evidence at the individual level: did the cyst on the defendant's brain cause him to murder his wife and then try to cover it up as a suicide?[51] The question here is not whether those with brain lesions generally should be excused, whether they should avoid the consequences of their actions; the question presented is whether Mr. Weinstein[52] may avoid criminal liability on account of the arachnoid cyst covering a substantial portion of his frontal lobe.[53] Now, we could generalize from whatever conclusion we reach on those facts—all of those with such brain anomalies have, at least, reduced criminal responsibility—but that does not change the focus of this portion of the materials: the question here is what the law should do with brain anomalies that do not affect all members of a demographic group.

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50. L&N, *supra* note 7, at 14.

51. *Id.* at 41–67.

52. Chapter 2 of L&N centers around discussions of Herbert Weinstein's murder trial. *Id.* Weinstein was accused of strangling his wife and throwing her from their high-rise apartment in an attempt to make the death look like a suicide. People v. Weinstein, 591 N.Y.S.2d 715, 717 (Sup. Ct. 1992).

53. Arachnoid cysts consist of fluid-filled sacs located between the brain and the arachnoid membrane. *Arachnoid Cysts Information Page*, NAT'L INST. NEUROLOGICAL DISORDERS & STROKE, https://www.ninds.nih.gov/Disorders/All-Disorders/Arachnoid-Cysts-Information-Page (last visited Feb. 18, 2017). The cysts can appear visually ominous on a brain scan, obscuring large areas of the brain. The cysts, however, may remain asymptomatic. *Id.* The danger in Mr. Weinstein's case was that the cyst was putting pressure on Weinstein's left frontal lobe, an area controlling the brain's executive functions. *Weinstein*, 591 N.Y.S.2d at 722.

The problems with such individual brain anomalies are largely problems of proof of causation, as the book well presents. Certainly the cyst looked quite dramatic on the fMRI scan, but how can we have any confidence that the cyst necessarily caused the behavior that the criminal law doctrine is designed to police? Indeed, unless we fortuitously had a scan of Mr. Weinstein's brain at a time when he was acting perfectly normally, we could not connect the dots from the problematic scan to the problematic behavior. That, though, is an empirical question; and once we recognize it as such, we are assuming the pertinence of it to the responsibility calculus: if we knew for a fact that Mr. Weinstein would not have killed his wife *but for* the cyst, then would we still impose criminal liability on him? If we did, what would we be punishing, Mr. Weinstein or the cyst (which could, perhaps, be excised)? Presented that way, the responsibility question in the context of individual brain anomalies challenges, or provides the basis to challenge, extant doctrine. It also juxtaposes the Crick and Morse view: if we are just the sum of neuronal activity, and we can change that activity by adjusting the neurons, then there is no other work for normative responsibility to do. But if, instead, per Morse, "brains do not kill people; people kill people,"[54] then Mr. Weinstein has no defense. We could pay no attention to his claim that "my brain made me do it."[55]

2. Neuroscience and the Group

While the use of neuroscientific insights has already been pertinent to individual cases, as the neural function of particular individuals is concerned, perhaps the more significant impact to date has been with regard to groups: specifically adolescents. There is no question that the "teen years" (and perhaps stretching well into the twenties) are a challenging time as the brain develops the social sense that will, in the normal course, accommodate successful adult interpersonal interactions.[56] But a good deal is going on within the developing brain: such as myelination of axons[57] and pruning of neuronal connections.[58] Teenage brains have more neural connections than adult brains[59]: but that is not a good thing. There are indeed too many

54. *See* Morse, *supra* note 49.

55. *Weinstein*, 591 N.Y.S.2d at 717.

56. *See* Sarah-Jayne Blakemore, *The Mysterious Workings of the Adolescent Brain*, TED (June 2012), http://www.ted.com/talks/sarah_jayne_blakemore_the_mysterious_workings_of_the_adolescent_brain (discussing brain development and adolescent behavior).

57. Myelination involves insulation of the portion of the neuron that transmits neural (electrical) messages. *See* Daniel Kantor et al., *Myelin*, MEDLINEPLUS, https://medlineplus.gov/ency/article/002261.htm (last updated June 1, 2015) ("Myelin is an insulating layer, or sheath that forms around nerves, including those in the brain and spinal cord. It is made up of protein and fatty substances. This myelin sheath allows electrical impulses to transmit quickly and efficiently along the nerve cells.").

58. Synaptic pruning eliminates excessive synapses not being utilized. *See* Beatriz Luna et al., *Maturation of Widely Distributed Brain Function Subserves Cognitive Development*, 13 NEUROIMAGE 786, 791 (2001) ("Synaptic pruning and myelination during childhood and adolescence are important for enhancing widely distributed brain functions by refining synaptic connections and enhancing the transfer of information throughout the brain in a rapid manner.").

59. *See* Debra Kelly, *The Difference Between Teenage Brains and Adult Brains*, KNOWLEDGENUTS (July 25, 2014), http://knowledgenuts.com/2014/07/25/the-difference-between-teenage-brains-and-adult-

connections, and some, many, of those must be pruned so that the important connections that facilitate successful (i.e., socially acceptable and efficacious) behavior will thrive.[60] There is certainly sufficient behavioral evidence to confirm that something is going on in the adolescent brain, and neuroscience is able to confirm just what that something is.[61]

But myelination and neural pruning are processes and, as such, may proceed at different rates in different people. While we might be able to look at an fMRI of an adolescent brain and venture a judgment (guess?) as to how "maturely" the adolescent with that brain structure would behave, we cannot certainly determine social maturity by reference to such a scan. We could not accurately predict the pace or eventual extent of development from such a scan either.[62] Brains are products of "nature" (i.e., genetic predispositions) and "nurture" (i.e., environmental forces). So even if two brains started out structurally identical (surely an impossibility), they would not mature in precisely the same way, because they would necessarily be subject to different environmental circumstances, and that is even true of identical twins raised in the same home.[63]

It is difficult, then, even impossible, to accurately coordinate the law with the mental ability of particular adolescents.[64] We fix rules just short of the point at which the cost of further precision in the rule's application would be greater than the social benefit realized from that precision. A gross example would be the voting age: there are certainly sixteen-year-olds who have more of the mental maturity (considering what all that might entail) necessary to vote responsibly than some forty-five-year-olds, but we use the bright line, eighteen years of age, as a certain and accessible determinant of the right to vote.[65] The cost of greater specificity would be too great to justify the costs (including the political costs of purporting to make those judgments reliably). For the most part, we are comfortable with rules that seem to come close enough to the mark: eighteen for voting, sixteen for driving, and twenty-one for drinking. But what if life and death are at stake?

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brains/ ("In an adult brain, there are a number of neural connections that allow the different parts of the brain to all work together. In the teenage brain, these connections aren't fully formed yet . . . .").

60. Sara B. Johnson et al., *Adolescent Maturity and the Brain: The Promise and Pitfalls of Neuroscience Research in Adolescent Health Policy*, 45 J. ADOLESCENT HEALTH 216, 217 (2009).

61. *See* Blakemore, *supra* note 56.

62. *See* Stephanie Burnett et al., *The Social Brain in Adolescence: Evidence from Functional Magnetic Resonance Imaging and Behavioural Studies*, 35 NEUROSCI. & BIOBEHAV. REV. 1654, 1657 (2011), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4538788/ ("Whether these changes correspond to continuing improvement in recognition accuracy for facial emotions, or to some other cognitive process, remains to be determined experimentally.").

63. *See generally* JUDITH RICH HARRIS, NO TWO ALIKE: HUMAN NATURE AND HUMAN INDIVIDUALITY (2006) (developing theory of human individuality).

64. Indeed, it is impossible to coordinate the law with any particular person. Professor Adam Kolber notes that identical criminal sentencing can lead to disparate levels of punishment depending on the offender's baseline condition. Adam J. Kolber, *The Comparative Nature of Punishment*, 89 B.U. L. REV. 1565, 1566 (2009) ("When we recognize the comparative nature of punishment, we see that, by putting two equally blameworthy offenders in prison for equal durations, the offender with the better baseline condition is likely punished more severely than the offender with the worse baseline condition.").

65. Brandon Griggs, *Should the U.S. Lower Its Drinking Age*, CNN (Jan. 4, 2015, 10:15 AM), http://www.cnn.com/2014/07/16/us/legal-drinking-age/.

The editors of L&N distinguish this group neuro-capacity issue from the individual assessments made in cases such as Mr. Weinstein's: the question is different and the science is different. We can look at a brain scan of a broad cross-section of adolescents and compare that with a brain scan of a broad cross-section of adults and see significant differences that might well justify substantial legal distinctions. But we neither know, nor even could know, where a particular adolescent is on the developmental curve. The U.S. Supreme Court has confronted this challenge in a line of cases considering the normative significance of brain development revealed by advances in neuroscience.[66] L&N includes the central cases, and carefully collects and edits the commentaries (legal and scientific) that have engaged the challenge.[67] Can neuroscience support the conclusion that an adolescent who murders, viciously and in cold blood, is *not* sufficiently mature, as a neural matter, to receive capital punishment or life imprisonment, but *is* sufficiently mature to make the decision about whether to have an abortion on her own, without parental involvement?

We might conclude that those two ostensibly contradictory conclusions are untenable, or we might not. We are used to drawing certain connections that it seems rational, in our folk psychological estimation, to draw: maturity of one kind, for one purpose and with regard to one question, would be a reliable indicator of maturity of other kinds, for other purposes and with regard to other questions. But cognitive psychology may draw distinctions where folk psychology cannot, and the distinctions that cognitive psychology will recognize may have salience so far as the normative balance struck by legal doctrine is concerned. If we recognize that the decision whether to kill in cold blood as part of a teenage escapade is neurologically different from the decision to have an abortion,[68] we might well conclude that a sixteen-year-old is competent to make one decision, and suffer the consequences therefor, but is

66. *See supra* note 46 (discussing L&N's treatment of *Roper v. Simmons*, *Graham v. Florida*, and *Miller v. Alabama*); *see also* Roper v. Simmons, 543 U.S. 551 (2005) (stating that death penalty for offenders under eighteen unconstitutional); Graham v. Florida, 560 U.S. 48 (2010) (stating that offenders under eighteen at time of crime cannot be sentenced to life imprisonment without the possibility of parole for non-homicide crimes); Miller v. Alabama, 132 S. Ct. 2455 (2012) (stating that *mandatory* life sentence without possibility of parole for juvenile offenders is unconstitutional).

67. *See* L&N, *supra* note 7, at 72–74, 84–87, 96–98 (providing excerpts from Brief for the American Psychological Association, and the Missouri Psychological Association as Amici Curiae Supporting Respondent, Roper v. Simmons, 543 U.S. 551 (2005); Letter to E. Joshua Rosenkrantz from Developmental Neuroscientists (July 16, 2009); Brief for the American Psychological Association, American Psychiatric Association, National Association of Social Workers, and Mental Health America in Support of Petitioner, Graham v. Florida, 560 U.S. 48 (2010); Terry A. Maroney, *Adolescent Brain Science After* Graham v. Florida, 86 NOTRE DAME L. REV. 765 (2011); Stephen J. Morse, *Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note*, 3 OHIO ST. J. CRIM. L. 397 (2006)).

68. *See* L&N, *supra* note 7, at 579–82 (providing excerpt of Laurence Steinberg et al., *Are Adolescents Less Mature Than Adults?: Minors' Access to Abortion, the Juvenile Death Penalty, and the Alleged APA "Flip-Flop"*, 64 AM. PSYCHOLOGIST 583, 593 (2009)); *see also* Steinberg et al., *supra*, at 593 ("In our view, then, the seemingly conflicting positions taken by APA in *Roper v. Simmons* (2005) and *Hodgson v. Minnesota* (1990) are not contradictory. Rather, they simply emphasize different aspects of maturity, in accordance with the differing nature of the decision-making scenarios involved in each case. The skills and abilities necessary to make an informed decision about a medical procedure are likely in place several years before the capacities necessary to regulate one's behavior under conditions of emotional arousal or coercive pressure from peers.").

not similarly able to make the other decision. So, then, it may be entirely consistent, and correct, as a matter of cognitive neuroscience, to proscribe imposition of capital punishment for the adolescent who murders in cold blood[69] but permit the adolescent to make the decision to have an abortion without parental notification.[70] That is, what seem to be two iterations of the same question[71] may in fact be significantly different in light of cognitive neuroscientific insights. And once that distinction is established empirically, certainly coherent legal doctrine, at least normatively coherent legal doctrine, would reflect that distinction. Now, there may well be other political, social, or behavioral reasons or evidence that would support such a distinction as well, but it would seem that the neuroscientific support would be at least as, and perhaps more, fundamental than alternative bases.

That confluence of considerations signals the paradigmatic shift, a shift demonstrated by the materials collected in and the presentation of L&N. The breadth and level of inquiry at this juncture in the book is profound. Indeed, in this part of the book and in the many others like it,[72] you get the very real sense that the normative ground is shifting under your feet: the law will now have to ask new questions, or at least the familiar questions in new ways, in order to vindicate the normative coherence and integrity of the doctrine. Folk psychology can take us, has taken us, only so far. And often, folk psychology suggests inconsistencies—such as the proscription of capital punishment for adolescents on account of their intellectual and emotional immaturity but vindication of minors' right to abortion without parental consent—that cognitive neuroscience can reconcile.

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69. *See* L&N, *supra* note 7, at 74–84 (excerpting Roper v. Simmons, 543 U.S. 551 (2005)). The defendant in *Roper*, seventeen at the time of the crime, planned the murder in advance:

> In chilling, callous terms he talked about his plan, discussing it for the most part with two friends, Charles Benjamin and John Tessmer, then aged 15 and 16 respectively. Simmons proposed to commit burglary and murder by breaking and entering, tying up a victim, and throwing the victim off a bridge. Simmons assured his friends they could "get away with it" because they were minors.

Roper, 543 U.S. at 556. The Court proscribed the death penalty for offenders under eighteen years old at the time of the crime. *Id.* at 578.

70. *See* Hodgson v. Minnesota, 497 U.S. 417, 450 (1990) ("[T]he requirement that *both* parents be notified, whether or not both wish to be notified or have assumed responsibility for the upbringing of the child, does not reasonably further any legitimate state interest.").

71. Or so they seemed to Justice Scalia. *See Roper*, 543 U.S. at 617–18 (Scalia, J., dissenting). His dissent pointed out that the American Psychological Association had taken, what Justice Scalia characterized as, inconsistent positions in *Roper* and *Hodgson*:

> As petitioner points out, the American Psychological Association (APA), which claims in this case that scientific evidence shows persons under 18 lack the ability to take moral responsibility for their decisions, has previously taken precisely the opposite position before this very Court. In its brief in *Hodgson v. Minnesota*, . . . the APA found a "rich body of research" showing that juveniles are mature enough to decide whether to obtain an abortion without parental involvement. The APA brief, citing psychology treatises and studies too numerous to list here, asserted: "[B]y middle adolescence (age 14–15) young people develop abilities similar to adults in reasoning about moral dilemmas, understanding social rules and laws, [and] reasoning about interpersonal relationships and interpersonal problems."

Id. (citations omitted).

72. *See* L&N, *supra* note 7, at 591–626 (discussing addiction); *id.* at 335–52 (neuroimaging and pain); *id.* at 353–55 (blurring of tort law's mental versus bodily injury distinction).

D. The Persistent Challenge

Notwithstanding L&N's presentation of the promise (or, at least, potential) of neuroscience to impact the law (both the pertinent evidence and the doctrine), the editors are very careful throughout to take account of the limitations of the current science, as well as the ways in which a little bit of knowledge may be a dangerous thing. Chapter 9 of the book follows the two chapters in which the editors present the science: a succinct primer on the brain (Chapter 7) and a survey of current imaging techniques (Chapter 8). The third chapter in that scientific triptych surveys the limitations of extant techniques and technologies both independently and in relation to one another. The presentation demonstrates how complementary use of different techniques may overcome the limitations of any one[73] but also candidly describes what the science just cannot (yet) do.[74] This acknowledgement of the state of the science is perfectly calibrated to discourage too much enthusiasm but also to propose something of an agenda: we learn what the science cannot (yet) do and how those deficiencies matter to reevaluation of the normative coherence of extant doctrine.

Though there certainly is reason to believe that there may be too much enthusiasm too soon for what neuroscience *may* accomplish, we would dismiss its challenge to the normative assumptions of legal doctrine at our peril. L&N quite well describes the limitations of the science but also treats the limits of the limits,[75] so to speak. It is crucial that we know just what the science cannot do so that we will have a better sense of what it can do and what we need to refine before we can make more confident assumptions about human agency that would be crucial to the normative calculus.

The brief survey of L&N's method developed in this Part supports the important fundamental inquiry that challenges law's normativity. It is to that

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73. *See id.* ch. 8 (discussing advantages of each technology).

74. *See, e.g.*, *id.* at 254–61 (discussing limitations of fMRI); *id.* at 250–53 (limitations of electroencephalography); *id.* at 225 (limitations of MRI); *id.* at 226 (limitations of Diffusor Tensor Imaging). L&N also provides an informative excerpt from Owen Jones et al., discussing some of the limitations of fMRI. *See id.* at 247–50 (reproducing in part Owen D. Jones et al., *Brain Imaging for Legal Thinkers: A Guide for the Perplexed*, 2009 STAN. TECH. L. REV. 5 (2009)).

75. *See id.* at 504–09 (providing alternative perspectives on the limitations and future admissibility of brain-based lie detection in the courtroom). An excerpt from Frederick Schauer notes that fMRI, though flawed, may be more reliable than juries:

> In law as in science, "compared to what?" is an important question. . . . Currently the jury or judge (when there is no jury) determines if witnesses are telling the truth. . . . [J]uries rely on numerous myths, urban legends, and pop psychology with little reliability. They distrust witnesses who perspire, fidget, and fail to make eye contact, and trust those who speak confidently while looking directly at them.

Id. at 505 (excerpting Frederick Schauer, *Neuroscience, Lie-Detection, and the Law*, 14 TRENDS COGNITIVE SCI. 101 (2010)). Henry Greely, however, argues for regulation of the sale of lie detection devices:

> A better solution, both for courts and more generally, would be to pass federal legislation requiring FDA-like regulation of all lie-detection drugs and devices . . . . We should prohibit the sale, marketing, distribution, or use of lie detectors until they have proven, by rigorous trials, to be safe and effective. . . . Should any improvement over a veteran FBI investigator, an experienced judge or a careful lay observer, be sufficient? . . . The correct answers are not obvious.

Id. at 507–08 (excerpting Henry T. Greely, *Premarket Approval Regulation for Lie Detections: An Idea Whose Time May Be Coming*, 5 AM. J. BIOETHICS 50 (2005)).

challenge, and L&N's treatment of it, that we now turn.

III. PHILOSOPHICAL PERSPECTIVES

From a philosophical perspective, the most important part of L&N is Part 2: "Brain, Behavior, and Responsibility." This is where students of human nature will want to dig deepest, for it is where the book addresses the relevance of neuroscience to our understanding of human agency—of rationality, of decision making and action, of moral and legal responsibility. This will be the focus of the remainder of our review.

The heart of Part 2 is Chapter 5, "Behavior and Responsibility: Views from Law and Neuroscience." This chapter offers a range of views concerning the correct relationship between law and neuroscience. At one extreme, philosopher Hilary Bok argues that neuroscience has no bearing on whether we have free will or whether we are morally responsible.[76] At the other, biologist Jerry Coyne argues that free will, understood as the ability to act otherwise, is ruled out by the laws of physics, which in turn rules out moral responsibility.[77] Between Bok and Coyne lie a handful of views, most of which are conciliatory. Most aspire to preserve a modest form of responsibility despite the threats posed by neuroscience to our understanding of agency.

For us, most of the views in Chapter 5 fail to appreciate the radical implications of neuroscience for the law. We suggest that, as the paradigm continues to shift, future editions of L&N will need to expand the range of views in Chapter 5 to include these radical implications. In defense of our view, we begin with the naysayers, with those who deny the importance of neuroscience for understanding human agency and responsibility. After explaining why those views fail to appreciate the unsettling implications of recent findings in neuroscience, we turn to theorists who aspire to preserve a relatively modest form of responsibility, and we explain why we think even those views do not go far enough. We conclude with the suggestion that our view captures the spirit and much of the letter of the biological behavioral model defended in an excerpt incorporated earlier in Part 2 (in Chapter 4) by Owen Jones and Timothy Goldsmith.[78]

A. Compatibilism and Folk Psychology: The Naysayers

Hilary Bok is a compatibilist concerning freedom of will.[79] Even if metaphysical determinism is true—even if every event, including every decision and action, is necessitated by the conjunction of prior events and the laws of nature[80]—still, some decisions and actions are nonetheless free. How

76. *Id.* at 130–32.
77. *Id.* at 129–30.
78. *Id.* at 107–17.
79. Russell Blackford, *Hilary Bok on Free Will*, TALKING PHIL. (Apr. 2, 2012), http://blog.talking philosophy.com/?p=4568.
80. This is roughly the definition given by van Inwagen. *See Peter van Inwagen, The Incompatibility of Free Will and Determinism*, 27 PHIL. STUD. 185, 198 (1975).

can that be?

In the short selection included in Chapter 5, Bok's argument for compatibilism goes something like this:

P1: In some cases, a person's actions depend on her choices, where those choices entail the existence of alternative actions.[81]

P2: Some actions do in fact depend on prior choice.

C1: Therefore, for some choices, there exist alternative courses of action.[82]

P3: If, in choosing between alternatives, a person steps back and produces a reasoned choice, the resulting choice and action are free.

P4: In some cases, persons do step back and produce reasoned choices between alternatives.

C2: Therefore, some actions are the result of a free choice (or a free will).[83]

For our purposes, the crucial claim is that, in some cases of deliberation, a person is "capable of stepping back from her existing motivations and habits, and making a reasoned decision among [alternative courses of action]."[84] If that capacity for reasoned decision making obtains, then, "according to compatibilists, she [the agent] is free."[85] This is Bok's fourth premise.

That premise is crucial in two ways. First, it appears to conflict with Bok's main thesis concerning the irrelevance of neuroscience to free will. For, according to Bok, free will requires the capacity to "step back" from our motivations and habits (presumably to tamp down the effects of our passions and prejudices), and the capacity to reason about how to act.[86] But that means free will requires a host of specific psychological capacities. If neuroscience were to discover that, contrary to appearances, humans do not possess those capacities, then Bok's compatibilism would fail. More precisely, Bok's compatibilism is plausible only if we discover that the psychological capacities required by her theory are in fact implemented in the nervous system of organisms like us.

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81. The alleged entailment in P1 is conceptual: if some event is a choice, then, given the meaning of "choice," that event involves the ruling out of alternative actions in favor of the action performed, in which case alternatives must exist.

82. Although our focus is Bok's fourth premise, skepticism concerning P1 (and thus C1) must be noted. Suppose determinism is true—suppose, à la van Inwagen, that every event, including every action, is necessitated by the conjunction of past events and the laws of nature. (That determinism might be true is, of course, a supposition that all compatibilists allow.) Then, for any "choice" we seem to make, there is one and only one available course of action. Hence, if determinism is true, genuinely alternative actions are metaphysically impossible. Bok of course knows this. That is why she insists on a strong distinction between the theoretical point of view—the perspective from which we comprehend the possible truth of determinism—and the practical point of view—the perspective of the active agent who must decide how to act. This is also why Bok insists on the primacy of the practical in questions of free will and responsibility. *See* HILARY BOK, FREEDOM AND RESPONSIBILITY 100 (1998). As will become clear, however, we do not think the theoretical-practical distinction can bear the weight of Bok's argument.

83. L&N, *supra* note 7, at 130–32.

84. *Id.* at 131.

85. *Id.*

86. *See* BOK, *supra* note 82, at 119.

Second, we should be skeptical of Bok's compatibilism and, indeed, any form of compatibilism.[87] As we describe below, there exists compelling evidence that we are not the kinds of organisms that compatibilist theories require. We are not, in particular, capable of rational deliberation in ways required for the attribution of responsibility.

Now, consider the well-known views of legal theorist Stephen Morse. Like Bok, Morse is a compatibilist who believes free will is irrelevant to responsibility or, more narrowly, to legal responsibility.[88] Unlike Bok, however, Morse does not think the presumed truth of compatibilism can establish the irrelevance of neuroscience to our view of ourselves as responsible agents.[89] To the contrary, Morse grants that neuroscience could undermine our present view of ourselves.[90] But he also insists that, to date, it has not done so.[91]

Morse's view boils down to three assertions. There is, first, a more or less specific view of persons built into the very fabric of criminal law, namely, the view provided by our folk psychological intuitions.[92] Second, according to our folk view, persons are responsible insofar as they are capable of engaging in practical reason[93] and acting on the basis of its deliverances.[94] Third, to date, neuroscience has discovered nothing to suggest that we are not possessed of that capacity:

> Given how little we know about the brain-mind and brain-action connections, to claim based on neuroscience that we should radically change our picture of ourselves and our practices is a form of

87. Consider, for example, neuroscientist Michael Gazzaniga's endorsement of a compatibilist view (also represented in Chapter 5). He claims that "brain determinism has no relevance to the concept of personal responsibility," and, moreover, that "responsibility exists at a different level of organization: the social level, not in our determined brains." L&N, *supra* note 7, at 133–34. Now, the excerpt from Gazzaniga is too brief to do justice to his larger view. Yet, the flavor of his remarks prompts us to observe that, in light of the evidence described below, moving from the neural to the social level in no way diminishes the threats posed by neuroscience to responsibility. How could it, if all our social attachments are mediated by our nervous systems, if all social relations are relations between nervous systems, especially between brains? Since neuroscience might discover that we lack the capacities required for responsibility in our social relations, the brain-based threat to responsibility remains. That social relations are neural relations is a view developed in recent work in social neuroscience, the progeny of a mating between social psychology and cognitive neuroscience. For an overview, see Dylan Wagner et al., *The Representation of Self and Person Knowledge in the Medical Prefrontal Cortex, in* 3 WILEY INTERDISC. REV. COGNITIVE SCI. 451 (2012).

88. Morse, *supra* note 49, at 2.

89. *See* L&N, *supra* note 7, at 123.

90. *Id.*

91. *Id.* at 128.

92. *Id.* at 123 (citing Stephen J. Morse, *Neuroscience and the Future of Personhood and Responsibility, in* CONSTITUTION 3.0: FREEDOM AND TECHNOLOGICAL CHANGE (Jeffrey Rosen & Benjamin Wittes eds., 2011)) ("Criminal law presupposes a 'folk psychological' view of the person and behavior."); *see also* Michael S. Moore, *Responsible Choices, Desert-Based Legal Institutions, and the Challenges of Contemporary Neuroscience*, 29 SOC. PHIL. & POL'Y 233, 237–44 (2012); Michael S. Moore, *Libet's Challenge(s) to Responsible Agency, in* CONSCIOUS WILL AND RESPONSIBILITY: A TRIBUTE TO BENJAMIN LIBET 207 (Walter Sinnott-Armstrong & Lynn Nadel eds., 2011).

93. We unpack the relevant notion of practical reason in the next section.

94. Here are two excerpts from Morse's contribution to Chapter 5: "[T]he law's view is that people are capable of acting for reasons and are capable of minimal rationality according to predominantly conventional, socially constructed standards." L&N, *supra* note 7, at 124. "The general capacity for rationality is the primary condition for responsibility and the lack of that capacity is the primary condition for excusing a person." *Id.* at 125. For further instances of the same claim, see Morse, *supra* note 49.

> neuroarrogance. . . . There is little reason at present to believe that we are not agents.[95]

Well then! Thanks to Bok and Morse, readers of L&N are confronted with a lovely challenge. Is it true that there is "little reason" (Morse) or no reason (Bok) to believe that neuroscience undermines the view we have of ourselves as rational and thus responsible agents? Is Morse right that the balance of scientific evidence supports the folk view of humans as possessed of a general capacity for practical rationality? Are we guilty of "neuroarrogance" if we claim otherwise? We think the answer to all three questions is "no," and shall explain why.

B. Cognitive and Affective Neuroscience

Our explanation is too complex to reproduce here in full, as it appeals to a convergence of evidence from several disciplines. We can, however, point to a few significant discoveries and then describe one way those discoveries converge on a conclusion that threatens our view of ourselves as practically rational and thus morally and legally responsible. For concreteness, we focus on criminal responsibility. We assume, along with Morse and our alleged folk intuitions, that a person is criminally responsible only if her action was uncoerced and only if she was capable of rational, practical deliberation prior to her action. But what is rational, practical deliberation? And what capacities are integral to it?

Although philosophical theories of practical reason are as diverse as they are legion,[96] the myriad subtleties do not matter here. The following model suffices for our purposes: if an agent has goal G—if he is motivated to bring about G—and if the agent believes he can bring about G by performing action A with equal or greater efficiency than other available actions, then, if he is rational, and if he has no contravening goals stronger than G, he will infer that he ought to do A.

Suppose you have the goal of deciding whether to adopt L&N as the text for a course you are scheduled to teach. Suppose your goal is to decide whether L&N is sufficiently interdisciplinary for your purposes. Suppose further that, to your delight, you just learned that a review of that book by a legal theorist and a philosopher is available! You now have, let us assume, strong motivation to track down and read our review. Suppose you also know the most efficient ways to obtain a copy of our review. Then, if you are rational, and if you do not have a stronger goal which conflicts with your obtaining a copy of our review, you will infer from the conjunction of your motivation and knowledge that you ought to perform those actions.

We assume that, in order to instantiate this overly simple model of

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95. L&N, *supra* note 7, at 128.

96. For helpful overviews of recent philosophical theories of practical reason, see R. Jay Wallace, *Practical Reason*, STAN. ENCYCLOPEDIA PHIL. (Mar. 26, 2014), http://plato.stanford.edu/entries/practical-reason/ and Elijah Millgram, *Practical Reason and the Structure of Actions*, STAN. ENCYCLOPEDIA PHIL. (May 11, 2016), http://plato.stanford.edu/entries/practical-reason-action/.

practical reason, the rational deliberator must possess the following minimal capacities:

(1) The capacity to know and understand facts relevant to the action;[97]

(2) The capacity to be motivated to perform, and also to not perform, the action;[98]

(3) The capacity to assign evaluative weights to the competing actions;[99] and

(4) The capacity to reason from one's knowledge and motivation to the conclusion that one ought to perform the action or to the conclusion that one ought to refrain.[100]

In addition, practical reasoning requires that the agent be:

(5) Responsive to reasons (motivations) that play a causal role in one's decisions and actions.

If we draw inferences from premises that do not refer to the causes of our action, then we are not really reasoning about our action. We might be concocting a rationale for acting—a story to tell if called upon to say why we acted as we did—but insofar as our rationale fails to specify the factors that in fact caused us to act, it is at best a rationale for an action we did not perform. In many instances, of course, people wholeheartedly believe the rationales they give for their actions even when the rationales are false. But, we take it as obvious that something can be a reason for an action only if it is among the causal factors for that action. That is a point on which Morse agrees.[101]

If those requirements are indeed necessary for practical reason, and if practical reasoning is required for responsibility, then evidence that we lack one or more of those capacities would show that our view of responsibility is under threat. More precisely, if the evidence shows that we lack those capacities under normal conditions in day-to-day living—the conditions under which most attributions of legal responsibility are made—then the threat to responsibility is substantial.

Such evidence, we will now argue, is indeed available and rests upon the integration of recent discoveries in cognitive neuroscience and affective

97. Including the fact, in the criminal law context, that the proposed action is illegal and may result in the loss of one's liberties.

98. If we are not motivated at a time to perform two or more distinct actions—for example, to perform and to not perform the illegal action—our deliberative capacities would not kick in.

99. If we are incapable of comparing what we take to be the immediate or long-term consequences of performing two or more distinct actions, we can hardly be said to be deliberating.

100. If we are incapable of *inferring* from relevant premises (relevant knowledge and motivation) to a practical conclusion (a specific action), then, while we may be engaged in some sort of mental activity, we are not engaged in *practical reasoning*.

101. *See* Morse, *supra* note 49, at 19 ("At present, the law's 'official' position—that conscious, intentional, rational and uncompelled agents may properly be held responsible—is justified unless and until neuroscience or any other discipline demonstrates convincingly that humans are not the creatures we think we are. That is, *if humans are not conscious and intentional creatures who act for reasons that play a causal role in our behavior, then the foundational facts for responsibility ascriptions are mistaken*." (emphasis added)). That is also a point on which philosophers disagree. For further discussion, see Wallace, *supra* note 96 and Millgram, *supra* note 96.

neuroscience. The integration of these discoveries supports two crucial claims. First, many actions are causally influenced by affective processes about which we cannot practically reason, precisely because the affective processes do not rise to conscious awareness. Second, some information about our affective processes can rise to conscious awareness, but when this occurs, the information sometimes fails to represent the actual causal processes involved.[102] Such integration, we contend, casts doubt on the assumption that we are equipped with the capacities for practical reason itemized in (1)–(5) above.[103]

We begin with Jaak Panksepp, the father of affective neuroscience.[104] Panksepp hypothesizes that there exists in all of us an ancestral mammalian mind implemented in sub-cortical processes.[105] Three features of this ancestral mind are crucial. It is constituted by relatively primitive affective capacities, and it is endogenous and autonomous. It is endogenous in that it comprises a set of capacities that do not require any learning for their operations. It is autonomous in that its operations require no signals or feedback from cortical capacities.[106]

The evidence for Panksepp's ancestral mind is extensive. We will mention just three considerations. First, the endogenous nature of our sub-cortical affective systems can be illustrated by the FEAR system.[107] FEAR can

102. Although the discussion in L&N focuses on a range of information from cognitive neuroscience, we suggest that, as the paradigm continues to shift, future editions will need to incorporate discoveries in affective neuroscience, including the ones discussed below.

103. A fuller explanation of the importance of integrating cognitive and affective neuroscience is given in a different context—a discussion of neuro-interventions—in Paul S. Davies, *Foundational Facts for Legal Responsibility: Human Agency and the Aims of Restorative Neuro-Interventions* (forthcoming).

104. Panksepp's discoveries of the sub-cortical systems that comprise our ancestral minds date back to the 1960s, 1970s, and 1980s. *See, e.g.*, Jaak Panksepp & Jay A. Trowill, *Intraoral Self-Injection I & II*, 9 PSYCHONOMIC SCI. 405, 407 (1967); Jaak Panksepp et al., *Modulation of Hypothalamic Self-Stimulation and Escape Behavior by Chlordiazepoxide*, 5 PHYSIOLOGY & BEHAV. 965 (1970); Jaak Panksepp et al., *The Biology of Social Attachments: Opiates Alleviate Separation Distress*, 13 BIOLOGICAL PSYCHIATRY 607 (1978); Jaak Panksepp & William W. Beatty, *Social Deprivation and Play in Rats*, 30 BEHAV. & NEURAL BIOLOGY 197 (1980); Jaak Panksepp, *Toward a General Psychobiological Theory of Emotions*, 5 BEHAV. & BRAIN SCI. 407 (1982); Jaak Panksepp, *Mood Changes*, *in* HANDBOOK OF CLINICAL NEUROLOGY 271 (P.J. Vinken et al. eds., 1985); Jaak Panksepp, *The Anatomy of Emotions*, *in* EMOTION: THEORY, RESEARCH, AND EXPERIENCE VOL. III. BIOLOGICAL FOUNDATIONS OF EMOTION 91 (Robert Plutchik ed., 1986); Jaak Panksepp, *Toward a Neuro-Cognitive Psychology of Emotions*, 32 CONTEMP. PSYCHOL. 799 (1987) (book review). The first truly comprehensive statement of his theory is in his 1998 book, AFFECTIVE NEUROSCIENCE: THE FOUNDATIONS OF HUMAN AND ANIMAL EMOTIONS. For an updated statement of his theory, see JAAK PANKSEPP & LUCY BIVEN, THE ARCHEOLOGY OF MIND: NEUROEVOLUTIONARY ORIGINS OF HUMAN EMOTIONS (2012).

105. *See* JAAK PANKSEPP, AFFECTIVE NEUROSCIENCE: THE FOUNDATIONS OF HUMAN AND ANIMAL EMOTIONS 41–59 (1998). See also Panksepp's many journal publications in which he presents his view, for example, Jaak Panksepp, *On the Embodied Neural Nature of Core Emotional Affects*, 12 J. CONSCIOUSNESS STUD. 158 (2005); Jaak Panksepp, *Cross-Species Affective Neuroscience Decoding of the Primal Affective Experiences of Humans and Related Animals*, PLOS ONE (Sept. 2011), http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0021236&type=printable.

106. We borrow the terms "endogenous" and "autonomous" from WILLIAM BECHTEL, MENTAL MECHANISMS: PHILOSOPHICAL PERSPECTIVES ON COGNITIVE NEUROSCIENCE (2008). To the best of our knowledge, Panksepp does not use these specific terms, but Bechtel's usage is apt for describing Panksepp's view.

107. *See* PANKSEPP, *supra* note 105, at 51. Panksepp uses uppercase lettering to designate the sub-cortical affective systems he has discovered and to highlight his claim that the functional effects of these systems do not map neatly onto our folk psychological emotional categories. The functions fulfilled by the

be triggered in rats by an external stimulus, such as a well-placed tuft of cat fur,[108] or an internal stimulus, such as a well-placed electrical current.[109] Indeed, if we stimulate any of the brain areas involved in fear—the central and medial amygdala, the medial hypothalamus, or parts of the brain stem—the animal will freeze at low levels of current and try to flee at higher levels, and it will exhibit autonomic responses typical of fear.[110] This holds for rats, cats, and every mammal species tested thus far.[111]

Second, Panksepp's primary-process systems are not only endogenous but also autonomous. This is clear from experiments in which the entire cortex of an infant mammal is surgically removed and the animal is raised along with its intact siblings.[112] Rough and tumble play, for instance, is a vital form of social interaction, and the play behavior of decorticated rats is difficult to distinguish from those whose brains are intact.[113] As Sergio and Vivien Pellis put it, "Play fights that involve decorticated rats are just as intricate, sustained, and repeated as those of intact rats, with escalation to serious fighting being rare. Together, these properties suggest that even without a cortex, such rats are capable of the reciprocity necessary to sustain playfulness."[114] Although they go on to identify two age-related differences that occur in male decorticated rats, differences that depend on cortical structures,[115] Pellis & Pellis, along with Panksepp and his collaborators, are clear that crucial emotional and social capacities are effectively implemented in sub-cortical structures and do not depend for their operations on any cortical structures.[116]

Third, and crucially, these endogenous, autonomous sub-cortical systems do not only exist in non-human mammals. They exist in us as well. We know this in part because sub-cortical systems in humans are functionally

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FEAR system, for instance, do not overlap the full range of instances in which we, on the basis of our folk psychological heritage, would apply the vernacular term "fear." Panksepp puts it this way: "[Uppercase lettering is used] to alert the reader to the fact that I am using the term in a scientific rather than simply a vernacular way: I am talking about a specific neural system of the brain that is assumed to be a major source process for the emergence of the related vernacular terminologies but which in the present context has a more clearly restricted neuro-functional referent." *Id.*

108. *Id.* at 18.

109. *Id.* at 213.

110. *Id.* at 215–16.

111. *Id.* at 206–24; PANKSEPP & BIVEN, *supra* note 104, at 175–202. In addition to discovering the sub-cortical FEAR system, Panksepp has discovered six other sub-cortical affective systems, including FEAR, RAGE, LUST, CARE, GRIEF, PLAY, and SEEKING. *See generally* PANKSEPP & BIVEN, *supra* note 104, at 175–202. He describes these systems as "primary-process" affective systems, where a system is primary if it is endogenous or built into the structure of the brain. *Id.* It is worth emphasizing that six of Panksepp's seven systems fulfill functions that are largely social.

112. PANKSEPP, *supra* note 105, at 291; Jaak Panksepp et al., *Effects of Neonatal Decortication on the Social Play of Juvenile Rats*, 56 PHYSIOLOGY & BEHAV. 429 (1994).

113. PANKSEPP, *supra* note 105, at 291; Panksepp et al., *Effects of Neonatal Decortication*, *supra* note 112; SERGIO PELLIS & VIVIEN PELLIS, THE PLAYFUL BRAIN: VENTURING TO THE LIMITS OF NEUROSCIENCE (2010).

114. PELLIS & PELLIS, *supra* note 113, at 48.

115. *Id.* at 51.

116. This is not to deny that cortical structures interact with sub-cortical structures in intact organisms; surely, they do. What is clear is that the sub-cortical capacities of these animals are sufficient on their own for a range of emotional and social competencies. Hence our claim that such systems are not only endogenous, but autonomous as well.

homologous with those in other mammals.[117] But we also know this from the study of human children born with little or no cortical tissue. Bjorn Merker describes a three-year-old girl born with very little in the way of functioning cortical tissue.[118] He describes the child's brain this way: "[s]pared ventromedial occipital and some midline cortical matter overlies an intact cerebellum and brainstem, whereas the rest of the cranium is filled with cerebrospinal fluid."[119] Merker goes on to point out that remnants of cortical tissue in anencephalic children typically develop no radiating connections to mid- and lower-brain structures and, in addition, may be found on autopsy to be gliotic.[120] Such remnants are likely possessed of little or no function.[121]

Yet, in a pair of contrasting photos included in Merker's discussion, we see the young girl, Heather Joy, just as her father is setting her baby brother on her lap, followed by her reaction a second or two later as she feels the weight and warmth of her brother. In the first photo, Heather has a look of wide-eyed expectancy; in the second, we see what appears to be an expression of intense pleasure, even joy.[122] At the very least, she appears to be experiencing an affective state with a very positive valence.[123]

The case of Heather Joy, along with similar cases documented by Alan Shewmon and colleagues,[124] exemplify the autonomy of our sub-cortical affective capacities. We see in Heather a pronounced affective reaction to a familiar stimulus[125] (perhaps the feel, smell, and sound of her infant brother), and we see in the children studied by Shewmon a range of discriminatory, emotional, and social capacities, as well as a capacity for associative learning, all implemented sub-cortically.[126] These are capacities that demonstrably operate in the absence of information from cortical structures. This, then, is some of the evidence for Panksepp's ancestral mind. It is evidence that the brains of all humans comprise an ancestral, affective brain nestled beneath our modern cortical structures, implementing a mind that causally influences our discriminatory, emotional, and social capacities whether we realize it or not.

At the same time, however, we know from Stanislas Dehaene's theory of consciousness that emotional capacities implemented in sub-cortical structures—including the primary process systems discovered by Panksepp—cannot rise to conscious awareness: not directly, at any rate.[127] Since our argument rests upon an integration of Panksepp and Dehaene, we pause to

117. PANKSEPP & BIVEN, *supra* note 104, at 1–6.

118. Bjorn Merker, *Consciousness Without a Cerebral Cortex: A Challenge for Neuroscience and Medicine*, 30 BEHAV. & BRAIN SCI. 63, 78, fig.8 (2007).

119. *Id.*

120. *Id.* at 78.

121. *Id.*

122. *Id.* at 79, fig.9.

123. *Id.*

124. D. Alan Shewmon et al., *Consciousness in Congenitally Decorticate Children: Developmental Vegetative State as Self-Fulfilling Prophecy*, 41 DEVELOPMENTAL MED. & CHILD NEUROLOGY 364, 364–74 (1999).

125. Merker, *supra* note 118, at 79.

126. Shewmon et al., *supra* note 124, at 364–70.

127. Stanislas Dehaene & Lionel Naccache, *Towards a Cognitive Neuroscience of Consciousness: Basic Evidence and a Workspace Framework*, 79 COGNITION 1, 12–15 (2001).

outline Dehaene's theory.

Dehaene studies a specific kind or level of conscious awareness, what he calls "consciousness-as-reportability"—a form of consciousness minimally required to give reasons for our actions and, therefore, to engage in practical reasoning.[128] Dehaene's central hypothesis is that this form of awareness is implemented in a complex and dynamic set of cortical structures.[129] The main components of his model are threefold. First, the human cortex comprises a set of functionally distinct areas, some more or less localizable, others distributed.[130] Each of these areas is functionally specialized; each receives a specific range of information as input, processes that information, and sends the results to other brain areas.[131] One such area is the global workspace—the second main component in Dehaene's model.[132] The workspace receives signals from functionally specialized brain areas and "broadcasts" them; it functions as a kind of central switching station, making incoming signals available to other specialized areas capable of receiving and processing them.[133] The auditory cortex, for example, receives information produced by perceived speech sounds, processes that information, and sends the results to the workspace where they are broadcast and perhaps received by other areas—including, in some instances, Broca's area—where further processing may result in a verbal response to the perceived speech sounds.[134]

The third component is a top-down attention mechanism capable of amplifying a proper subset of signals that reach the workspace. When that mechanism amplifies a given signal, and if that amplification crosses a certain threshold, a self-sustaining processing loop will emerge.[135] The content of the amplified signal then becomes the object of conscious awareness.[136] In addition, the amplified signal is broadcast to other specialized areas, and when those other areas receive the amplified signal, their activity will typically increase, thereby expanding the scope of conscious awareness.[137]

On this model, there are several ways a neural signal can fail to rise to conscious awareness. For our purposes, the most decisive way is architectural. When a specialized brain area bears no architectural connections to the workspace, its outputs have no chance of rising to conscious awareness[138]: at

128. *See id.* at 1–37; Stanislas Dehaene et al., *Toward a Computational Theory of Conscious Processing*, 25 CURRENT OPINION NEUROBIOLOGY 76, 76 (2014).

129. Dehaene & Naccache, *supra* note 127, at 12–29.

130. *Id.* at 12–13.

131. *Id.*

132. *Id.* at 12–15, 24–29.

133. *Id.*

134. Although Dehaene & Naccache do not give this specific example, it clearly illustrates the first two components of their view, and it is consistent with their remarks about speech production, which in turn illustrate their claims concerning the anatomy of consciousness. *See id.* at 26–28.

135. *Id.* at 15.

136. *Id.*

137. This point is clear from Dehaene & Naccache's discussion of attentional amplification and, in particular, from their claim that "[i]t is the style of activation (dynamic long-distance mobilization), rather than its cerebral localization, which characterizes consciousness." *Id.* at 14–15.

138. For discussion of this crucial point, see *id.* at 15–22 (describing how when a specialized brain area bears no architectural connections to workspace, its outputs have no chance of rising to conscious awareness).

least not directly. What might rise to awareness are the downstream somatic effects of that area. Dehaene offers the following example: "[T]he activity of many neurons, for instance in subcortical and brainstem nuclei, is excluded from conscious mobilization (e.g., circuits for respiration or emotion). In many cases we become aware of those circuits only through their indirect effects on other representations, such as in somatic cortical areas."[139] On this model, emotional or affective capacities implemented in sub-cortical areas cannot rise directly to conscious awareness, due to the very architecture of the brain.[140] At most, the causal effects of these capacities may rise to awareness, but only indirectly.

To appreciate the indirectness involved, consider the comparison to respiration. Our myriad respiratory processes never send signals to the global workspace. We become aware of respiratory distress only after the fact—we experience shortness of breath, for instance, only after we have been running for several seconds. The same is true, according to Dehaene & Changeux, of our sub-cortical affective processes.[141] Signals from those affective systems never reach the workspace.[142] Instead, a sub-cortical system such as FEAR might produce a set of somatic changes. If those somatic changes produce cortical representations that are broadcast to the global workspace, then we will likely become conscious of those somatic changes. What comes to awareness are not outputs from the FEAR system, but representations of somatic changes, and insofar as these representations are ambiguous—insofar as, for example, tightness in the chest is symptomatic of processes other than fear—they require interpretation.

Here, then, is our integration of affective and cognitive neuroscience: If Panksepp is correct, our ancestral affective mind animates all our deliberations, decisions, and actions. Our primary-processes affects are causal factors for most, if not all, our actions.[143] If Dehaene is right, none of our ancestral affective processes rise to conscious awareness; none has a direct route to awareness.[144] At best, sub-cortical affects with sufficient strength produce downstream effects that might rise to awareness, and those effects are subject to interpretation (more on this presently).[145] With this integration before us, let us now consider just two consequences, both of which cast doubt on the assumption that we are endowed with the minimal capacities for practical reason itemized above.

The first consequence is simple but important. Consider sub-cortical, affective processes that produce downstream somatic effects too weak to reach the global workspace. Consider, for instance, the non-conscious effects of low-level anxiety, stress, fear, frustration, anger, depression, lust, etc. These

139. Stanislas Dehaene & Jean-Pierre Changeux, *Neural Mechanisms for Access to Consciousness*, *in* THE COGNITIVE NEUROSCIENCES 1145, 1148 (Michael S. Gazzaniga et al. eds., 3d ed. 2004).

140. *Id.* at 1148–49.

141. *See* Dehaene & Naccache, *supra* note 127, at 15–18 (describing indirect nature of awareness).

142. *Id.*

143. *Id.*

144. *Id.*

145. *Id.*

effects no doubt influence our moods, motivations, decision making, and actions in myriad ways we fail to notice.[146] Being too weak to reach the workspace, they nonetheless shape our psychology in ways that are difficult to discern from the first-person perspective, that is, from the perspective of consciousness-as-reportability.[147]

It is worth noting, moreover, that the effects of low-level, non-conscious processes on our decisions and actions are abundantly confirmed by experiments in cognitive and social psychology.[148] And when we combine such evidence from psychology with the above integration of affective and cognitive neuroscience, we are faced with a convergence of evidence that, in a wide range of cases, we are indeed moved by affective processes about which we have no reportable conscious awareness.[149] There exist affective factors that contribute to our decisions and actions, about which we cannot practically reason.[150] Such decisions and actions, therefore, are beyond the pale of responsibility, on the folk psychological assumption that we are responsible for actions performed as a consequence of practical reason.

The second consequence, though less straightforward, is also of considerable importance. Consider sub-cortical effects strong enough to reach the global workspace. Despite reaching conscious awareness, the role of such effects in practical reason is fraught with difficulties, the most obvious being that they may amount to a form of internal coercion.[151] The root worry is that we must interpret affective effects that come to awareness before we can employ them in our practical reasoning, and when our interpretations are incomplete or erroneous, the practical conclusions drawn may fail to track the actual causes of our action.[152] When this happens, when our explicit reasons for acting are not among the actual causes, our action is due to factors outside

146. *See infra* note 148.

147. *Id.*

148. In one study, for instance, Piotr Winkielman et al., exposed subjects subliminally to either a happy, neutral, or angry face, followed by a masking stimulus. Piotr Winkielman, et al., *Unconscious Affective Reactions to Masked Happy Versus Angry Faces Influence Consumption Behavior and Judgments of Value*, 31 PERSONALITY & SOC. PSYCHOL. BULL. 121, 122–35 (2005). Immediately after the mask, some subjects were asked to rate their mood on a short survey (to determine whether their conscious feelings had been altered by the subliminal prime) and then given a fruit beverage to drink. *Id.* at 124. Subjects were free to pour and drink as much beverage as they liked, and the quantity consumed by each subject was monitored. *Id.* at 125. The other subjects were given a limited quantity of the same fruit beverage and asked to rate how well they liked it. *Id.* at 124. They were then given the same short survey to determine their consciously reportable feelings. *Id.* This study produced two important findings. First, the ratings of the fruit beverages correlated positively with the type of face to which they had been subliminally exposed. *Id.* at 132. Those exposed to a happy face rated the beverage higher than those exposed to an angry face. *Id.* Second, the conscious feelings reported by subjects did not correlate with the type of face subliminally perceived. *Id.* Those exposed to a happy face reported conscious feelings indistinguishable from those exposed to an angry face. *Id.* This study thus demonstrates that a stimulus of which we have no awareness can causally influence our affective processes in ways we do not consciously notice, even though the alterations in our affective processes exert a demonstrable causal effect on our judgments and our actions. *See id.* Subjects exposed non-consciously to a happy face judged differently (they rated the fruit beverage differently) and acted differently (they consumed more of the fruit beverage) than those exposed to an angry face. *Id.*

149. *Id.*

150. *Id.*

151. *Id.*

152. *Id.*

our deliberative field.[153] Such actions result from factors we can neither resist nor endorse precisely because we have no awareness of their efficacy.[154] In such cases, responsibility for our actions is attenuated on the same grounds that we withhold responsibility for actions due to compulsion.[155]

Consider, for instance, cases in which sub-cortical fear produces tightness in the chest, sweaty palms, heightened sensory acuity, and so on. If those symptoms are broadcast in the workspace, might they figure in our practical reasoning as required by conditions (1)–(5)? Yes, but only if they are first interpreted. Reasoning from downstream somatic effects of our affective processes is not the same as reasoning from our affective processes.[156] We need some way to interpret those somatic effects, some means with which to assign them a motivational value. We need to establish that, for any given set of somatic effects, they reliably indicate the causal efficacy of such-and-such sub-cortical affective system.

But we have no such reliable method. We have inferences to what may appear to be the best explanation, but in fact we have no reliable grounds to distinguish correct from incorrect inferences.[157] This is so, at any rate, for a non-trivial range of cases.[158] To see why this is so, recall Michael Gazzaniga's split-brain subjects.[159] We can be confident, in light of Gazzaniga's experiments, that the following partial model of our practical reasoning capacities is highly plausible:

> The Neural-Damage-Deprivation Model of Giving Reasons: Whenever our left hemisphere operates in the absence of causally

153. *Id.*

154. *Id.*

155. *Id.*

156. *Compare* Dehaene & Changeux, *supra* note 139, *with* Winkielman, et al., *supra* note 148.

157. For a classic illustration of the unreliability of such inferences, see Stanley Schachter & Jerome Singer, *Cognitive, Social, and Physiological Determinants of Emotional State*, 69 PSYCHOL. REV. 379 (1962).

158. Some inferences to the best explanation are more plausible than others. When the situation is relatively simple, our inference might be reliable or, more modestly, it might be reasonable to assume that they are reliable. Of course, the notion of "relative simplicity" is horribly vague, though it is clear enough in certain cases. As social psychologist Timothy Wilson suggests: "It might be difficult to discern how the deep-seated facets of our personality have shaped our behavior, but easier to tell that we are angry at John for forgetting our dinner date, sad because we just heard that our grandmother is ill, or nauseous because we just ate an entire bowl of clam dip." TIMOTHY D. WILSON, STRANGERS TO OURSELVES: DISCOVERING THE ADAPTIVE UNCONSCIOUS 98 (2002). More generally, "the *causal interpretive system* [the psychological system by which we discriminate between events that are causally related and events that are not] . . . works best when the situation is relatively simple and unambiguous, rendering the possible causes of one's action few in number and transparent in character." DAVIES, *supra* note 11, at 146.

159. *See* Michael S. Gazzaniga, *Cerebral Specialization and Interhemispheric Communication: Does the Corpus Callosum Enable the Human Condition?* 123 BRAIN 1293 (2000). In one well-known split-brain experiment, *see id.* at 1316, distinct visual information is fed to each hemisphere. The right hemisphere, for example, receives information about a snow scene, while the left receives information about a chicken. The subject is then presented with an array of objects visible to both hemispheres, and is asked to choose any objects from the array relevant to what he saw in the previous step. Using his right hand, he points to a chicken claw; using his left, he points to a snow shovel. Finally, the subject is asked to justify his selection of objects. Of course, his left hemisphere knows nothing about the snow scene; it knows nothing of the actual cause of his selecting the snow shovel. And now it needs to make sense of having just selected a shovel despite being utterly clueless of the actual cause. Since most of the subject's linguistic capacities are implemented in his left hemisphere, those capacities have no choice but to confabulate. They invent a "reason" for choosing the snow shovel that at least coheres with having also selected the chicken claw.

> relevant information isolated outside the left hemisphere (i.e., in the right hemisphere), it invents a "reason" for the agent's action based on whatever information it can access.[160]

Yet, if this model is plausible, it should be easy to generalize to a model with much greater scope, a model that applies to all persons:

> The Structural-Deprivation Model of Giving Reasons: Whenever our conscious, reason-giving capacities operate in the absence of causally relevant, non-conscious information, or in the presence of indirect, conscious information, they invent a "reason" for the agent's action based on whatever information they can access.

The Structural-Deprivation Model is compelling because, in one crucial respect, we are all like Gazzaniga's subjects. His subjects, as a result of surgery, were deprived of any architectural connections between the two hemispheres.[161] If Dehaene and Panksepp are right, virtually all persons are constituted by an ancestral brain nestled inside modern cortical capacities, where the ancestral brain bears no architectural connections to our capacity for consciousness-as-reportability.[162] The point is not that the direct connections have been surgically destroyed; the point is that they never evolved in the first place.[163]

Given the non-existence of such architectural connections, the best we can do is interpret the indirect effects of our sub-cortical capacities. The best we can do is what Gazzaniga's subjects did: concoct an explanation by trying to make sense of the information that happens to be available.[164] Of course, there is information available besides the felt downstream effects. There is information about the immediate environment, patterns of past behavior, recollections of past interpretations, etc. Yet, these additional forms of information were also available to Gazzaniga's subjects. And yet, based on all available information, those subjects wove a coherent interpretation of their actions that was nonetheless false.[165] The point, of course, is that the information available to those subjects was critically incomplete and critically ambiguous.[166]

Since we, like Gazzaniga's subjects, are faced with the task of making as much sense as possible of information that is incomplete, or ambiguous, or both, we must accept that, in such cases, our interpretations have the same

160. *Id.* at 1319–20.

161. *Id.* at 1295.

162. Just to be clear: we are not asserting our ancestral brain bears no connection to our neo-cortex. That would be silly. The claim is that our sub-cortical emotions bear no direct connection specifically to our capacity for consciousness-as-reportability.

163. *See* Davies, *supra* note 103 (discussing the importance of the Structural-Deprivation Model).

164. Gazzaniga, *supra* note 159, at 1316.

165. *Id.*

166. In one experiment, the subject's left-hemispheric linguistic capacities had no access to information in the right hemisphere about a perceived snow scene. *Id.* As a result, the left hemisphere had no idea—none at all—why the subject's left hand pointed to a snow shovel. *Id.* This perceptual information—the left hand pointing at a snow shovel—illustrates what we mean by "critically ambiguous" information. For discussion of this particular experiment, see MICHAEL S. GAZZANIGA, THE MIND'S PAST 24–26 (1998) and Gazzaniga, *supra* note 159.

status, namely, interpretations that may feel utterly correct from the first-person perspective, but that nonetheless may be partially or wholly mistaken. Short of subjecting ourselves to controlled experiments, such inferences are, at bottom, hunches or guesses for which we have no generally reliable method of confirmation. From the first-person perspective—the perspective from which we engage in practical reasoning—we are faced, in a non-trivial range of cases, with an impressive bit of self-ignorance.

This form of interpretive self-ignorance gives rise to the second important consequence of our integration. On Morse's view, and as described above,[167] the reasons one employs in one's practical inferences must be among the actual causes of our actions. If you reason to some action on the basis of reasons that misrepresent the actual causes, then your conscious reasoning was, in part or in whole, causally irrelevant to the performance of that action.[168] In such a case, the factors that actually caused you to act were outside your field of deliberative awareness.[169] They were akin to a form of internal coercion, since you, the "conscious decision maker," were impotent with respect to them.

In cases such as this, attributions of criminal responsibility are out of place. The folk intuitions that lead us to withhold responsibility in instances of coercion should likewise lead us to withhold it here. Therefore, except when we have reasonable evidence that the agent's expressed reasons match the actual causes of her actions, we are in no position to claim that folk psychological conditions for criminal responsibility are met.

We conclude, therefore, that the Bok/Morse attempt to ground responsibility in practical reasoning conflicts with what is implicit[170] in knowledge derived from affective and cognitive neuroscience. The balance of evidence derived from the above integration is that we do not possess some of the required capacities for practical reason. The causal effects of our ancestral minds on our actions, combined with the architectural and interpretative limitations of conscious awareness, suggest that we are not the kind of organisms required by compatibilist theories of free will or by our folk view of our own agentive capacities.[171] And this discovery is of great significance to current conceptions of legal responsibility and, more generally, to all of the law.

C. Thin Responsibility vs. Utilitarian Punishment?

Some authors excerpted in Chapter 5—authors who, like us, insist on the relevance of neuroscience to free will and responsibility—wish to defend a

167. See especially condition (5), *supra* text accompanying notes 97–101, in our list of conditions required for practical rationality.

168. *See* Morse, *supra* note 49, at 20 ("Whether one explains action causally or holistically, the theory of action presupposes that it is a person that acts based on the person's desires, beliefs, and intentions.").

169. *Id.*

170. And now made explicit in the above integration.

171. This is why we claim (in our introduction) that, as the paradigm continues to shift, future editions of L&N will need to expand the views represented in Chapter 5 to include the more radical implications of progress in neuroscience, including the implications of the integration described herein.

notion of responsibility that is far less robust than the ones endorsed by Bok and Morse.[172] The excerpt from Patricia Churchland is illustrative.[173] She suggests that the traditional debate on free will should be replaced with a neuroscientifically informed study of the differences between persons with normal control of themselves and persons with comprised control.[174] And, in the final paragraph of her excerpt, Churchland seems to endorse the preservation of some notion of responsibility: "So is anyone ever responsible for anything? Civic life requires it be so. . . ."[175] Another illustration is the view proposed by Joshua Greene & Jonathan Cohen.[176] They criticize libertarian notions of free will and retributivist views of punishment, and plump for a compatibilist view of free will and a consequentialist view of punishment.[177] And they seem to think that these latter two views enable them to preserve a thin but nonetheless important notion of responsibility.[178]

Both these views reject retributivist theories of punishment and instead endorse a consequentialist theory.[179] In addition, both wish to preserve responsibility, on the grounds that some concept of responsibility is required by consequentialist theories of punishment.[180] Civic life requires attributions of responsibility, according to Churchland, presumably because it is correct to say that persons with normal capacities of self-control are sometimes responsible for their actions.[181] Greene & Cohen are more explicit.[182] In their view, "we can say that the actions of rational people operating free from duress, etc. are free actions," and, in consequence, that such persons can properly be held responsible.[183]

If so—if Greene & Cohen and Churchland wish to preserve a thin notion of responsibility—we think they should reconsider. Two points are relevant. First, consequentialist theories of punishment do not require any attributions of responsibility. A nice example from Derk Pereboom makes this point: many believe that some cases of forced quarantine are justifiable on consequentialist grounds.[184] Returning soldiers or health workers who might be carrying a communicable disease capable of triggering an epidemic may, with sufficient

172. L&N, *supra* note 7, at 130–32 (Bok); *id.* at 123–28 (Morse).
173. *Id.* at 134.
174. *Id.* at 135.
175. *Id.*
176. *Id.* at 134–44.
177. *Id.*
178. Joshua Greene & Jonathan Cohen, *For the Law, Neuroscience Changes Nothing and Everything*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y BIOLOGICAL SCI. 1775, 1783 (2004), *reprinted in* L&N, *supra* note 7, at 142 ("The vindication of responsibility in the absence of free will means that there is more than a grain of truth in compatibilism. . . . [W]e will want to distinguish the various classes of people who cannot be deterred by the law from those who can. . . . We will also recognize familiar justifications such [as] those associated with crimes committed under duress . . . . [W]e can say that the actions of rational people operating free from duress, etc. are free actions, and that such people are exercising their free will.").
179. *Id.* at 1775–76.
180. *Id.* at 1776, 1783.
181. Patricia Churchland, *The Big Questions: Do We Have Free Will?*, NEW SCIENTIST (Nov. 15, 2006), https://www.newscientist.com/article/mg19225780-070-the-big-questions-do-we-have-free-will/.
182. Greene & Cohen, *supra* note 178, at 1775–76, 1778.
183. *Id.* at 1783.
184. *See* DERK PEREBOOM, LIVING WITHOUT FREE WILL 174 (2001).

justification, be deprived of their liberties for a circumscribed period of time. Even against their will. This justification holds despite the fact that the persons forced into quarantine cannot be said to be responsible in any moral or legal sense for the fact that they might be carriers of a deadly agent. If so, if the loss of liberties can be justified without the attribution of moral or legal responsibility, then, on our understanding of their views, neither Churchland nor Greene & Cohen have adequate grounds on which to preserve any notion of moral or legal responsibility.

Our second point is that, on the view defended in this review, all compatibilist theories of free will and responsibility are difficult to square with the implications of the integration of Panksepp and Dehaene. As we saw in Bok's view, the heart of any compatibilist theory is the assumption that we are capable, in some range of conditions, of practical reason sufficient for moral responsibility. Our integration of Panksepp and Dehaene calls this assumption into question. If we are correct, then the attribution of responsibility to persons whose actions can be regulated with incentives may be no more apt than attributions to those whose actions must be regulated in some other way.

D. Practical Reason from a Biological Point of View

As suggested by Jones & Goldsmith in Chapter 4, if the law's concept of the person is informed mainly by our folk psychological concepts, then it is profoundly incomplete and probably mistaken in substantive ways.[185] What is missing is the biological point of view. Indeed, insofar as we are products of evolutionary history, we should see ourselves and all our psychological capacities in precisely that light. We should accept as our default position that there is no such thing as a psychological capacity that is not a biological capacity. This, we surmise, is part of the paradigm shift suggested by Jones & Goldsmith's claim that the law must be informed by the findings of behavioral biology.[186]

It thus is no accident that, of all the authors represented in Chapter 5, the biologist's view appears closest to ours. Coyne asserts the non-existence of free will and moral responsibility, and although he endorses a system of rewards and punishments, he refrains from insisting that a consequentialist system of punishment somehow saves responsibility.[187] Exactly so.

Perhaps more than any other theorist represented in Chapter 5, Robert Sapolsky clearly endorses the Jones & Goldsmith behavioral biological model.[188] Sapolsky describes neuroscientific evidence for two crucial claims. The first is that there are persons capable of knowing that a given action is illegal or otherwise wrong, but who suffer from an organic impairment in their capacity for volitional control.[189] The second is that impairments in volitional

185. L&N, *supra* note 7, at 107–17.

186. *See* Owen D. Jones & Timothy H. Goldsmith, *Law and Behavioral Biology*, 105 COLUM. L. REV. 405, 418 (2005) (discussing irrational behavior and decision-making processes).

187. L&N, *supra* note 7, at 129–30.

188. *Id.* at 142–47.

189. *Id.* at 145.

control fall on a continuum and may be pervasive across large swathes of the human population.[190] You fall somewhere on this continuum, as do we. If so, the doubts raised above concerning our capacities for practical rationality are confirmed. In addition to our integration of Panksepp and Dehaene, it may be a pervasive fact that we are not the kind of organisms presupposed by our traditional views of responsibility. It is thus difficult to overstate the importance of the biological point of view for properly assessing our folk psychological assumptions about ourselves.

Indeed, Sapolsky's claim that we can have knowledge that fails to connect to our affective and motivational capacities is an important extension of our integration of Panksepp and Dehaene.[191] Sapolsky gives evidence that we often "know" things—believe them at the level of conscious awareness—in such a way that the relevant beliefs do not engage our affective capacities.[192] This provides yet another reason why the views of practical reason presupposed by Bok, Morse, and others fail to apply to organisms like us, at least for a range of conditions under which we must deliberate and act in our daily lives. No doubt the view endorsed by Bok and Morse proceeds from the conceptual categories bequeathed to us by our cultural (mostly theological?) predecessors. But it is not a view that will survive further neuroscientific inquiry.

IV. CONCLUSION

We began this Essay with the suggestion that L&N signals, even encourages, a paradigm shift in the sense that Thomas Kuhn understood dramatic shifts in scientific inquiry proceed. It is when the existing paradigm, or conventional thought, begins to fail that there is room, indeed, real need for, a new paradigm that can make sense of the anomalies that emerge under the old paradigm. "Folk psychology," and its relationship to the deontological basis of legal doctrine, is an old paradigm that has begun to show its age, and disutility, as anomalies emerge across the fundamental doctrinal categories: In tort law, the doctrine fails to recognize the fundamental affinity of physical and so-called "mental" or emotional harm,[193] and pain remains a mystery for which the doctrine can only temperamentally account.[194] Neuroscience reveals that

190. Sapolsky, *supra* note 42, at 1794, *reprinted in* L&N, *supra* note 7, at 146 ("There is little support for the idea that over the range of PFC [prefrontal cortex] function, there is a discontinuity, a transition that allows one to dichotomize between a healthy PFC in an individual expected to have a complete capacity to regulate behaviour, and a damaged PFC in someone who cannot regulate their behaviour. The dichotomy does not exist.").

191. *Cf.* Dehaene & Naccache, *supra* note 127; PANKSEPP, *supra* note 105; Sapolsky, *supra* note 42 (examining how recently discovered neurobiological processes explain non-normative human behavior).

192. Davies, *supra* note 103, refers to such knowledge as "action-irrelevant," that is, knowledge that is causally impotent with regard to the specific action despite being consciously grasped by the agent.

193. *See, e.g.*, RESTATEMENT (THIRD) OF TORTS: LIAB. FOR PHYSICAL & EMOTIONAL HARM § 48 cmt. g (AM. LAW INST. 2012) ("The law of negligence has never applied the ordinary rules of foreseeability to emotional harm. . . . [A]s a matter of policy [emotional harm] is an injury whose cost the legal system should not normally shift . . . ."); RESTATEMENT (SECOND) OF TORTS § 436A (AM. LAW INST. 1965) (categorically denying recovery for negligently caused emotional injury without accompanying bodily harm).

194. *Compare* KENNETH S. ABRAHAM, THE FORMS AND FUNCTIONS OF TORT LAW 65 (4th ed. 2012)

all injury is ultimately physical; all pain has a physical correlate and can only be appreciated and appraised in terms of brain states.[195] The criminal law doctrine depends on conceptions of retribution that result in the generation of *more* crime and greater, unnecessary human suffering; the growing disquiet with mandatory sentencing signals the emergence of that anomaly.[196] And even in contract law, where consent has done the normative heavy lifting for hundreds of years, cracks in the edifice are emerging: it just makes no sense to talk in terms of consent to "agreements" designed to discourage real understanding.[197]

Even if Kuhn overstates the impact of paradigm shift in the history of science, new paradigms emerge when the discovery of anomalies in the accepted way of thinking begin to compromise the explanatory power of the accepted wisdom:

> Discovery commences with the awareness of anomaly, i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern normal science. It then continues with a more or less extended exploration of the area of anomaly. And it closes only when the paradigm theory has been adjusted so that the anomalous has become the expected. Assimilating a new sort of fact demands a more than additive adjustment of theory, and until that adjustment is completed—until the scientist has learned to see nature in a different way—the new fact is not quite a scientific fact at all.[198]

And that is where the debate, the tension, is now: has neuroscience revealed a new "science" of law?

While it is unusual to write an essay reviewing a law school course book,[199] we believe that the significance of L&N and neuroscience for the study of law and its normative foundations (also often the focus of undergraduate and graduate philosophy courses) makes it important, even vital, that the law and philosophical academies take account of the challenge presented by this new paradigm. L&N is not flawless: we have suggested

("[M]ental infirmities are invisible, hard to measure, and incompletely verifiable."), *with* Tor D. Wager et al., *An fMRI-Based Neurologic Signature of Physical Pain*, 368 NEW ENG. J. MED. 1388, 1394 fig.2B (2013) (suggesting that fMRI data can validate self-reports of pain).

195. Luis R. Valadez, *Is Pain Real or Is It All in Your Head? Neuroscience Explains*, LEARNING MIND (July 21, 2014), http://www.learning-mind.com/is-pain-real-or-is-it-all-in-your-head-neuroscience-explains/.

196. Greene & Cohen, *supra* note 178, at 1775–76.

197. *See generally* OREN BAR-GILL, SEDUCTION BY CONTRACT: LAW, ECONOMICS, AND PSYCHOLOGY IN CONSUMER MARKETS (2012); OMRI BEN-SHAHAR & CARL E. SCHNEIDER, MORE THAN YOU WANTED TO KNOW: THE FAILURE OF MANDATED DISCLOSURE (2014); MARGARET JANE RADIN, BOILERPLATE: THE FINE PRINT, VANISHING RIGHTS, AND THE RULE OF LAW (2012); Yannis Bakos et al., *Does Anyone Read the Fine Print? Consumer Attention to Standard-Form Contracts*, 43 J. LEGAL STUD. 1 (2014); Symposium, *"Boilerplate": Foundations of Market Contracts*, 104 MICH. L. REV. 821 (2006).

198. KUHN, *supra* note 6, at 52–53.

199. *But see* Margaret S. Bearn, *Cases and Materials on Remedies*, 51 FORDHAM L. REV. 196 (1982) (reviewing EDWARD D. RE, CASES AND MATERIALS ON REMEDIES (1982)); Douglas Laycock, *A Case Study in Pedagogical Neglect*, 92 YALE L.J. 188 (1982) (reviewing RICHARD E. SPEIDEL ET AL., TEACHING MATERIALS ON COMMERCIAL AND CONSUMER LAW (3d ed. 1981)); J.S. Waterman, *Cases on Federal Jurisdiction and Procedure*, 14 TEX. L. REV. 128 (1935) (reviewing ARMISTEAD M. DOBIE, CASES ON FEDERAL JURISDICTION AND PROCEDURE (1935)).

where future editions might focus and expand the inquiry, and we would each adjust and perhaps supplement the materials to better meet pedagogical goals in the courses we teach. But L&N is more than a tentative beginning: it marks a sea change, a demonstration that a paradigm shift is underway. We must take account.